The Noise Advisory Council

Traffic Noise: the Vehicle Regulations and their Enforcement

Report by a working group of the Council

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Advisory Council

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CHAPTER ONE

INTRODUCTION

1. The 1970 vehicle census showed that there were over fourteen million motor vehicles on the roads of Great Britain. The number is growing rapidly —faster indeed than the population. By 1980 we are likely to have one vehicle for every three people. It has been estimated that already at least a fifth (and possibly more than two fifths) of the urban population are exposed in their homes to undesirable levels of traffic noise; and if nothing is done half as many people again are likely to be so exposed by 1980. Traffic noise is thus by far the most widespread source of noise nuisance and the most urgent target for abatement action.

2. Although traffic noise is fortunately not at a level which one could expect to cause physiological harm, it can be to the highest degree unpleasant and can affect almost every aspect of everyday life; in particular activities that depend on hearing—notably conversation—and sleep. These effects have not been measured precisely, but their seriousness is indicated by the strength of public resistance to traffic or road proposals which it is feared would increase noise in particular places.

3. An initial review of the traffic noise problem led the Noise Advisory Council to conclude that the best prospect for immediate relief lay in the more effective enforcement of the existing vehicle noise regulations. We were therefore appointed by the Council in May 1971 to:—

> "discuss with officials the formulation and evaluation of possible courses of action to improve procedures for the enforcement of vehicle noise regulations (with particular reference to a scheme for directing owners of vehicles considered to be noisy to present their vehicles to a testing station); and to report to the Council."

4. In preparing our report we have been greatly assisted by officers of the Department of the Environment (who have carried out certain special studies at our request) and of the Home Office and by Mr. J. A. H. Gott, Chief Constable of the Northampton and County Constabulary. We are also grateful to the Noise Abatement Society for supplying us with details of their views and proposals on the problem we have been studying; to the British Standards Institution for providing the report reproduced at Annex E; and to our Joint Secretaries for their work on the drafting of the report.

CHAPTER TWO

BACKGROUND

Lines of attack

5. Levels of traffic noise are a function not only of the number of vehicles but also of their design and the way they are driven and maintained. The nuisance people experience depends also on the planning of roads and buildings, traffic routeing and arrangements for parking. There are therefore a number of ways of tackling the problem:—

i. vehicles can be quietened;

ii. steps can be taken to ensure that drivers maintain and use their vehicles so that they do not cause unnecessary noise;

iii. people can be protected from nuisance by palliative measures such as the soundproofing of dwellings and other buildings and the placing of noise barriers alongside roads;

iv. traffic can be routed away from places where quiet is most valued (e.g. residential areas, schools, hospitals) by traffic management schemes;

v. new roads and other new developments can be so planned as to keep traffic noise away from people.

6. In all these matters the Secretary of State for the Environment has a central rôle. He makes the regulations which control the construction and use of vehicles, he is the highway authority for motorways and trunk roads, and he has a considerable influence over the design of roads and the traffic arrangements for which local authorities are responsible.[1]

7. The existing noise regulations, with the enforcement of which this report is primarily concerned, relate to methods (i) and (ii) above; but we think it right to draw attention to the importance of environmental management in the overall strategy for dealing with traffic noise. By its very nature the fabric of our towns and cities, roads and buildings, will change very slowly, and can thus only in the very longest term be redesigned to minimise the effects of traffic noise. **But the plans and policies that regulate the future pattern of urban structures are in the process of formulation now. We consider that noise control should be a primary consideration in the strategies of the planning and highway authorities; and that plans (at both national and local level) for the building of new roads and the improvement of existing ones, and for the restriction or control of the use of vehicles on particular routes should be designed to take full advantage of opportunities for the alleviation of noise nuisance.** It would, in our view, be wrong to assume that measures to deal with traffic noise at source, more immediate though their effect may be, will render unnecessary these parallel measures in the environmental field, which should be pressed forward at every opportunity.

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(1) In Scotland and Wales, however, the respective Secretaries of State are the Highway Authority for trunk roads and have general overall responsibility for traffic management.

8. **We also welcome, and commend to the Minister for Transport Industries, the recommendation of the Working Group on Lorry Parking[1], that a national chain of lorry parks should be set up. This proposal offers the prospect of much needed relief from the noise nuisance caused by the starting up in the early hours of the morning, of heavy goods vehicles parked indiscriminately in residential streets.**

9. The private car is by far the most numerous and widespread creator of unwanted noise and its contribution to the noise problem is growing through the rapid increase in its numbers. Heavy goods vehicles, public service vehicles, motorcycles and certain specially designed sports cars are less numerous, but not, for that reason, a less important source of nuisance. Goods vehicles are becoming larger and more powerful, and tending as a result to become noisier; while in the sporting fringe of the motoring and motorcycling world, noise is part of the characteristic *panache,* being either built into the vehicle at the construction stage or added to it by the owner. Public service vehicles are a special case. They are not only normally powered by large diesel engines but are mostly confined to urban and suburban use. As stage carriers, they are continually stopping and starting and accelerating—a driving mode conducive to high noise emissions. By their nature they are predominantly among the noisiest of vehicles, employed in the most noise sensitive areas, and used in a way in which the creation of unwelcome noise is hardly avoidable.

10. Until very recently Government action on vehicle noise has been directed principally at the user rather than the manufacturer. But while controls over the user are essential in curbing individual excesses the root of the problem is the fact that motor vehicles, particularly those powered by diesel engines, are at present noisy machines. **Any realistic programme to secure significant general reductions in vehicle noise must include measures directed to the development of quieter engines and vehicles.**

Noise limits for new vehicles

11. During the last decade most developed countries have formulated objective noise standards which must be met by new vehicles registered in their countries. This has become possible through the development and standardisation of methods of measuring vehicle noise; most countries (including the United Kingdom) now follow the test procedure recommended by the International Standards Organisation[2].

12. In this country Regulation 23 of the Motor Vehicles (Construction and Use) Regulations 1969[3] which was first made in 1968 came into effect for new vehicles in April 1970. In most respects it follows the limits recom-

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(1) Lorry Parking—The Report of the Working Party on the Parking of Lorries HMSO October 1971.

(2) The British Standard (BS 3425: 1966) which forms the basis of the British Regulations lays down quantitative limits based on the ISO procedure.

(3) This and the other regulations discussed below are reproduced at Annex A.

Table 1: **Noise limits which motor vehicles must be constructed to meet**

(1)	dB(A) measured by ISO procedure					
	ECE Regulation (2)	EEC Directive (3)	UK Reg. 23 (vehicles first used after 1.4.70) (4)	(5)	Future UK limits: Effective dates — Manufacture (6)	Future UK limits: Effective dates — First use (7)
Motorcycles over 125 cc	84–86 (depending on cylinder capacity)	(Not covered)	86	(To be determined)	—	—
Cars	84	83	84	80	1.4.73	1.10.73
Diesel engined cars, cross-country vehicles ..	(Not covered)	(Not covered)	84	82	1.4.74	1.10.74
Light passenger vehicles	85	84	84			
Light goods vehicles	85	84	85			
Heavy vehicles						
up to 200 hp	89	90	89	86	1.4.74	1.10.74
over 200 hp	92	92		89		

Notes: a. Selected categories only shown.

b. The decibel "A" scale adjusts vehicle noise measured in physical units so as to correspond with the subjective impression of loudness. An increase of 10 dB(A) corresponds approximately to a doubling of loudness.

c. The EEC limits have been adjusted to take account of tolerance allowed in measurement.

mended by the Economic Commission for Europe (ECE) in a "Regulation" which member countries may adopt[1]. More recently the Commission of the European Economic Community (EEC) has issued a technical directive to the six member countries on this subject[2]. The maximum noise levels prescribed for the major classes of vehicle by the ECE Regulation, the EEC Directive and the UK Regulation are set out in columns 2–4 of Table 1 on page 4.

Improved vehicle design

13. There is no great technical problem in making cars which are quieter than the average model of today. The limit of 84 dB(A) imposed by UK Regulation 23 has been fairly easy for most vehicle manufacturers to meet; the only models which have required attention are some of the sports cars and special high-performance versions of normal saloons. Noise of high performance cars can often be reduced by more efficient silencing equipment; the main commercial objection is that this usually results in some loss of performance and, of course, the noise itself may have sales appeal. Already progress in design has made a reduction to 80 dB(A) possible in the very near future; and looking further ahead still lower limits should be feasible even for high performance cars.

14. Motorcycles present a less tractable problem. Quantitatively the nuisance they cause is diminishing as their numbers have tended to decline at an annual rate of about 10% over recent years. In 1967 the total motorcycle population of the United Kingdom was 1,350,000, in 1970 only 1,048,000. But in terms of the noise created by individual machines, motor cycles are perhaps the most annoying of all vehicles to the great majority of the population. The British motorcycle industry relies to a large extent on the production of motorcycles with exposed single-or double-cylinder air-cooled engines—a combination of characteristics which is not conducive to quietness. A change to water cooling might be one answer, but such a requirement made unilaterally in this country would have a severe effect on our motorcycle industry, with its high proportion of exports. Although there are real technical difficulties in quietening the conventional British air cooled motorcycle, we do not think that these are insuperable. On the other hand the industry is not without its troubles and perhaps is not in the best position to mount the heavy research and development effort needed to make possible a substantial reduction in motorcycle noise limits. Clearly an effective stimulus is needed to bring about improvements. **We are of the opinion that the Government itself should devote resources towards the research and development of quieter motorcycles; and we are glad to learn that a programme of Government sponsored research into motorcycle noise aimed at developing quieter machines is at present being planned.**

15. Heavy diesel-engined vehicles are not only the noisiest type of vehicle but also the most difficult and costly to quieten because (apart from the

(1) Regulation 9 annexed to the 1958 Geneva Agreement concerning the adoption of uniform conditions of approval and reciprocal recognition of approval for motor vehicle equipment and parts.

(2) Directive No. 70/157/EEC of 6 February 1970.

exhaust system) the engine structure, the process of combustion and the mechanical auxiliaries contribute importantly to the noise they emit. Although some improvement has been achieved, the standard laid down in Regulation 23 is still not being universally met. **We therefore welcome the recently announced five year project for the development of a quiet heavy goods vehicle,** to be carried out by the Vehicle Engineering Division of the Department of the Environment, the Transport and Road Research Laboratory, and (under contract) the Institute of Sound and Vibration Research of the University of Southampton, the Motor Industry Research Association, British Leyland, Rolls Royce and Foden. **We are advised that, if completed successfully, this should enable heavy goods vehicles with a maximum noise level of 80 dB(A) (quieter than the average car today) and a corresponding reduction in interior cab noise, to be mass produced by 1980. We urge that this project be given the highest priority.**

16. We are informed that the problems of producing quieter public service vehicles are generally less severe than for other heavy commercial vehicles. It is our understanding that some public service vehicles are already designed for minimum noise. This raises the question whether separate noise limits—lower than those for other heavy vehicles—should not be set for public service vehicles. We recommend that the Government consider taking that step when vehicle noise limits are next reviewed. Meanwhile we should like to see bus operators pay increasing attention to quietness of design in their purchasing policy.

17. Regulation 23 was the first step in controlling vehicle noise by imposing maximum permitted limits on vehicles at the construction stage. It has been effective in restraining further increases in noise from new vehicles and in stimulating research into the design of quieter vehicles. But its requirements were necessarily modest. It has been estimated that perhaps 95% of vehicles coming on to the roads *before* the regulation came into effect would have complied with them. It was, however, always envisaged that once this new system of control had been established the requirements would be made progressively more stringent over the years as new and foreseeable technological developments permitted.

18. **New and more severe noise limits for certain types of new vehicle have in fact recently been announced** to take effect at fixed dates over the next three years. These are set out in columns 5–7 of Table 1 on page 4.

19. **This tightening of the controls is a welcome next step. Although it is disappointing that the time-lag is so great,** it is of course necessary to bear in mind the desirability of keeping in step if possible with the requirements of other advanced countries, and the technical difficulties involved in designing and mass producing quieter engines—difficulties that increase with every further reduction in noise level.

20. In order to facilitate speedier progress towards the introduction of acceptably quiet vehicles, it will be necessary to give impetus to the move-

ment towards international standardisation of vehicle noise requirements. **We therefore warmly welcome the recently expressed intention of the Minister for Transport Industries to press, within the forum of the Economic Commission for Europe, for stricter international standards on noise.**

Control of noise from vehicles in use

21. While the long term prospects for achieving substantial reductions in the general level of vehicle noise through improved design are good the fact remains that there are 14 million existing vehicles already on the road. Controls applied at the manufacturing stage will do nothing to quieten these. Measures to prevent the emission of excessive noise due to inadequate maintenance are therefore necessary and can make a more immediate impact.

22. The need to control noise from vehicles in use was recognised in the early days of the motor vehicle, and a number of regulations were made in the first decades of this century; these are currently consolidated in the Motor Vehicles (Construction & Use) Regulations 1969[1]. The most important requirement has been that vehicles should be fitted with an efficient exhaust silencer (Regulation 22) which the user of the vehicle must see is properly maintained and not altered so as to increase noise (Regulation 82). There are also general regulations requiring road users to refrain from making an "excessive" noise (Regulations 87 and 88) and from running the engine unnecessarily (Regulation 90), and there are special rules about vehicle horns: they must not be sounded in built up areas at night or when the vehicle is stationary (Regulation 91). These regulations have been and still are important. They cover a great variety of potential noise from vehicles—including, for example, the clatter of badly loaded goods vehicles and the unnecessary revving up of the engine.

23. They have, however, now been supplemented by a new regulation (No. 89) which prohibits the use on a road of any vehicle which emits noise in excess of maximum permitted limits. The regulation applies to all vehicles on the road whatever their age. The current in-use limits are set out in Table 2. They are necessarily somewhat higher than those laid down for the construction of new vehicles (cf Table 1). The method of enforcing these limits is prescribed in the Regulation. As the provision relates to vehicles on the roads the check has to be carried out at the roadside. To constitute an offence under the Regulation the vehicle has actually to exceed the noise limit on the public road. It would not be an offence as the requirements now stand if it were merely proved, at an off-road site, that the vehicle was *capable* of exceeding the permitted limit. The Regulation, therefore, provides only for testing on the roads. The conditions under which the noise checks are carried out and the apparatus used must conform with the relevant British Standards (BS 3425 and BS 3539 respectively).

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(1) See Annex A.

Table 2 **In-use limits**

	Vehicles first used before 1.11.70	Vehicles first used on or after 1.11.70
	dB(A)	dB(A)
Cars	87	87
Motorcycles over 125 cc	90	89
Heavy vehicles	92	92

CHAPTER THREE

ENFORCEMENT—THE PRESENT SITUATION

New Vehicles

24. The enforcement of standards on manufacturers does not present any major problem. Most countries have a system of type approval whereby Government Inspectors have to pass a sample of each new vehicle model before it can be put on the market. The Secretary of State for the Environment has certain powers to introduce such a system in this country in respect of goods and public service vehicles and consideration is being given, in connection with the likelihood of British entry into EEC, to the extension of these powers to other classes of vehicles and to the development of a practical system. **We welcome the Minister for Transport Industries' announcement on 7 October 1971 that an effective system for enforcing the proposed new construction limits will be devised and applied.**

Vehicles in use

25. The current level of police activity in enforcing the regulations dealing with noise from vehicles in use is illustrated in Table 3 below.

Table 3: **Police activity in enforcing vehicle noise regulations**

England and Wales

		Total of alleged offences	*Total written warnings by police*	*Total prosecutions involving findings of guilt*	*Total fines imposed*
					£
Noise caused by faulty silencer	(Reg. 82)	16,006	2,259	13,327	48,149
Excessive noise due to defect or lack of repair, etc, faulty packing or adjustment of load	(Reg. 87)	321	80	227	892
Not stopping engine so far as necessary to prevent excessive noise when stationary	(Reg. 90)	112	69	42	170
Sounding horn in built up areas between 11.30 p.m. and 7 a.m.	(Reg. 91)	303	107	195	656
Sounding horn when stationary	(Reg. 91)	181	85	90	256
Excessive noise through lack of reasonable care by driver	(Reg. 88)	290	62	204	909
Exceeding the maximum permitted sound level	(Reg. 89)	8	6	2	2

Note: This table is extracted from the Home Office publication "Offences relating to Motor Vehicles" for 1970. No corresponding figures for Scotland have been compiled.

Enforcement—The Present Situation

26. The pattern of police prosecutions under these regulations has not changed much in recent years, and it seems probable that the standard of driver behaviour has remained fairly constant. What has changed the situation is the growth in the total number of vehicles on the roads, especially the number of heavy goods vehicles with large diesel engines. It will be seen from Table 3 that the great majority (94%) of the findings of guilt relate to noise caused by a faulty silencer.

27. To assist our work the Department of the Environment have undertaken a special roadside survey of nearly ¼ million vehicles. It will be seen from the report of the survey (at Annex B) that 5,380 of these vehicles were considered to be so noisy as to suggest that they had defective or ineffective silencers. Despite some inconsistencies in the results of the survey, we think that the inference can reasonably be drawn that some ¼ million of the more than 14 million vehicles currently on the road may be assumed at any given time to be operating with defective or ineffective silencers. Of these, the proportion whose owners will be prosecuted is evidently very small and, as Table 3 shows, those who are prosecuted and found guilty are likely to incur only a trivial fine. There is thus considerable justification for the widespread feeling that too many vehicle owners are able to ignore the noise regulations with impunity.

28. It will be noted in particular, from the last line of Table 3, that there has so far been no effective enforcement of the quantitative noise limits on vehicles in use described in paragraph 23 above—only a handful of prosecutions having been brought. We find that the difficulty here arises from the nature of the test procedure prescribed. This calls for equipment which is expensive both to buy and maintain and can be used only in conditions which are infrequently met with on British roads. In addition the procedure makes substantial demands on manpower and appears to offer the possibility of challenge in the courts on a number of technical grounds. In these circumstances it is hardly surprising that enforcement has been minimal. However, as we show in the next part of our report new noise testing techniques are emerging which offer a prospect of more effective enforcement by way of spot roadside checks as well as in association with periodic statutory vehicle tests.

CHAPTER FOUR

TOWARDS BETTER ENFORCEMENT

Exhaust systems (Regulations 22 and 82)

29. Normally when a vehicle leaves the factory it is fitted with a silencer system of adequate quality. Unless the system is subjected to violent damage which causes a rupture, it becomes gradually ineffective through corrosion until it completely ceases to fulfil its silencing function. Many motorists delay replacing badly corroded silencer systems until their effectiveness has been seriously impaired. Thus many vehicles run on the road with silencers which, even if not completely ineffective, are well below an acceptable level of efficiency. Some silencers are not replaced even when fractured or so badly corroded as to be for all practical purposes useless. Often when silencer systems are renewed inferior replacements are used because they are cheaper than the manufacturer's recommended system and these are often subject to a faster rate of deterioration. The use of sub-standard exhaust systems as replacements is likely to aggravate the nuisance caused by defective silencers unless they are themselves replaced as soon as their loss of effectiveness is observed. A much less prevalent (but no less distressing) element in the problem caused by the use of ineffective silencers is the deliberate substitution of silencers (designed to improve performance) which are noisier than those supplied by the manufacturer. This practice is mostly confined to the more exuberant owners of sports cars and motorcycles but there is a specialised trade in such anti-social accessories.

30. We have concluded (paragraph 27) that about a quarter of a million (or nearly 2%) of the vehicles on the road at any given time have defective or ineffective silencers and are therefore in breach of Regulation 82; and that at the present level of enforcement the chances of the owner of one of these vehicles being caught and prosecuted are obviously remote. If found guilty he is likely on average to be fined £3. **We should like to see a much more intensive effort by the police to enforce the regulations on silencers (though we recognise that with all the demands made upon their limited resources there is a limit to what can be done). We should also like to see magistrates exercise their discretion to impose heavier fines for these offences within the maximum of £50 prescribed by law.** We have, however, thought it right to consider by what other ways the nuisance caused by ineffective silencers could be alleviated.

31. At present there exist no restraints on the selling or fitting of sub-standard or designedly ineffective exhausts; and the only means currently available for the detection of offending vehicles, other than heavy goods vehicles and public service vehicles (whose silencers are inspected annually), lie in chance encounters with vigilant policemen. The Working Group considers that the introduction of a more formal system of control over the maintenance and re-equipment of exhaust systems might do much to reduce the problem of defective and ineffective silencers. **We therefore consider that the Department of the Environment should examine urgently the possibility of introducing Regulations laying down a system of approval for vehicle**

silencers (perhaps similar to that contained in the Economic Commission for Europe Regulation No. 9). **The object of this would be to make it illegal to fit unsuitable or poor-quality silencer systems or those designed to emit an unreasonable amount of noise. The Department should also consider the possibility of devising Regulations which would make it illegal deliberately to sell ineffective silencer systems** (perhaps on the analogy of Section 12(2) of the Road Transport Lighting Act 1957 which prohibits the sale of sub-standard reflectors). **In devising such a system of approval the Department should also give attention to the possibility of setting minimum standards of durability for silencers.** Although an annual test of a component that is liable to become defective at any time throughout the year is bound to be limited in its direct effect, the certainty that such a check would be made might have a considerable effect in making drivers aware of the importance of maintaining the effectiveness of exhaust systems. We therefore also think that **the Department should, in the context of the recently announced review of the annual vehicle testing scheme, include in the annual test of cars and motorcycles a visual check on the efficiency of exhaust and silencer systems.**

Noise limits for vehicles in use (Regulation 89)

32. **We regard the setting and enforcement of maximum permitted noise levels for vehicles in use as an essential component of any effective programme for the alleviation of nuisance from traffic noise. Unfortunately, however, the procedure prescribed in Regulation 89 for substantiating breaches of that Regulation,** viz. the measurement of noise emitted from vehicles when actually in use on the road, **has been found to present insuperable difficulties** (see paragraph 28 above); and this has resulted in the Regulation's becoming, for all practical purposes, a dead letter. **We have therefore thought it right to investigate alternative methods of enforcement.**

Screening for test

33. **We have in particular considered a scheme for directing owners of vehicles considered noisy by a police constable or other authorised officer to present their vehicles to a testing station.** Proposals along these lines have been put forward by the Noise Abatement Society and are set out at Annex C.

34. The object of any such scheme would be to substitute for direct enforcement on the road, the selection of probable offenders and their direction to a testing station at which compliance or non-compliance with regulation 89 could be definitely established. The advantages would be

(a) that the owner of any vehicle selected by the initial screening process would have a strong incentive to have any necessary work done to bring it into conformity with the regulation, before presenting it for test;

(b) that the eventual test would provide clear evidence on which to base the prosecution of any vehicle owner who had failed to take that precaution.

The disadvantages would be that the initial screening process would necessarily be fallible; and that, to the extent that it was so, vehicle owners who had committed no noise offence would be put to trouble and inconvenience. We discuss below in more detail some of the problems involved in devising a fair and workable scheme.

35. The initial screening might be carried out by the human ear or by use of suitable measuring instruments. The trained human ear is probably better able to distinguish between concurrent noises from different sources than all but the most sophisticated instruments; and its ability to detect fine differences in the intensity of noise should not be under-estimated. **We feel, however, that there would be a deep-seated reluctance on the part of many vehicle owners to accept the judgement of a police constable or other authorised officer (however well trained his ear) as a sufficient basis for putting them to the trouble of presenting their vehicle at a testing station. We therefore inquired into the possibility of cheap portable noise meters being supplied to patrolling policemen for initial screening. The Noise Abatement Society have sponsored the development of such a meter (the "Noise Torch").** This instrument is a low cost device which indicates by means of a signal lamp when a predetermined sound level has been exceeded. A switch enables the operator to set the threshold level of the signal lamp to the equivalent sound levels of 70, 80 or 90 dB(A).

36. The practicability of the screening procedure proposal would clearly be dependent on the availability of an instrument which would be at once cheap, compact and light, and also reasonably accurate, reliable and consistent in its readings. We were satisfied that the Noise Torch had the necessary physical characteristics and we made enquiries as to its efficiency. We were told that the original version had been subjected to tests (including field trials and laboratory checks) by the Department of the Environment in November 1970. Since, however, further versions had subsequently been developed we asked that further trials should be carried out on them and that tests should be made also by an independent testing agency. Accordingly in July 1971 further tests were made by the Department's Vehicle Engineering Division and by the British Standards Institution.

37. Reports on these tests are reproduced at Annexes D and E. They indicate that, **in its present form at least, the Noise Torch is not a suitable aid to law enforcement.** The tests showed that the meters were erratic in performance and slow in response, there was a wide spread in calibration between samples, and individual models suffered a shift in calibration over time.

38. **Accurate portable noise meters do** of course **exist but** we are advised that **none of them is both light enough to be carried with comfort by patrolling policemen and cheap enough to be considered for general issue. The concept of a portable screening device is none the less attractive and the possibility of developing one that meets all the requirements should not be overlooked.**

39. **Even given a satisfactory instrument, however, the obtaining of reliable readings under operational conditions would present difficulties.** In the measurement of noise, the distance of the vehicle from the microphone is of crucial importance. The policeman at the roadside would need to station himself at a measured distance from the kerb if the check was to give any indication of conformity with a test in appropriate conditions. He would have to pace out this distance from the kerb, making sure that there were no adjacent walls to reflect sound. On taking a reading he would have to check that the recorded noise level exceeded the appropriate noise limit (watching out at the same time for extraneous noise) and to take the registration number of the vehicle while it was still within reading distance. **In less than ideal conditions the scope for error would be substantial.**

40. The greater the fallibility of the screening process, the more difficult it becomes to justify requiring someone to present his vehicle at a testing station on the strength of a single measurement. It was no doubt with this consideration in mind that the Noise Abatement Society proposed that if screening indicated that a vehicle might be in breach of Regulation 89, its details should be reported; and that only after three such reports should the owner be required to present his vehicle for testing. We see a number of practical difficulties in this procedure, which, in any event, will not be feasible until there exists a central vehicle register equipped with a computer which can receive and record police reports from all over the country and issue the necessary instructions when three reports have been recorded in respect of any one vehicle. A central vehicle register is at present planned by the Department of the Environment to be in operation by the end of 1976. We are advised, however, that this system could not readily be adapted for the purpose we are considering here.

41. **If the cost and inconvenience of presenting a vehicle for noise testing is to be less than that involved in prosecution and conviction** (as it clearly must be, in view of the relatively uncertain evidence on which the vehicle owner would be subjected to it) **testing facilities would have to be available at many thousands of locations throughout the country.** The Noise Abatement Society, who recognise this, urge that appropriate facilities should be made available at all the 20,000 or so garages operating the DOE annual test for private vehicles. **However the physical conditions required for the form of test at present prescribed in Regulation 89 exist at few,** if any, of these **garages; and whatever alternative form of test might be devised for the purpose, it seems unlikely that sufficient open space and skilled staff would be available in more than a minority of these garages.**

42. The proponents of a system of screening for test start from a recognition that the measuring of noise from vehicles actually in use on the road cannot provide sufficiently reliable evidence on which to base a prosecution. They therefore propose that such measurements should be used for the lesser purpose of identifying probable offenders and requiring those vehicles to be taken to a location where skilled staff and facilities are available to establish

definitely whether or not they comply with the appropriate statutory noise limit.

43. We have drawn attention above to a number of difficulties which stand in the way of the introduction of such a procedure. It is, we think, clear that this is not at present a practicable proposition; but this is not to say that if it were thought to be the best solution to the problem of enforcement and if sufficient effort and resources were devoted to it, it might not at some future date become a practicable proposition.

44. However, before recommending that the Government's efforts be concentrated to that end, we have thought it right to consider whether it is necessary or desirable to continue to rely on measurements of noise from vehicles actually in use on the road as an essential (even if not the only) element in enforcement.

Static testing of diesel engined vehicles

45. It was clear to us that the difficulty of enforcing Regulation 89 would be greatly reduced if it were possible for non-compliance to be established by testing a suspect vehicle when stationary. This possibility has been investigated by the Vehicle Engineering Division of the Department of the Environment and their conclusions are set out in the report on "A testing Procedure to Measure the Noise Potential of Motor Vehicles at Space Restricted Sites", reproduced at Annex E. This shows that **it is possible,** using noise meters complying with the requirements laid down in Part 1 of BS 3539: 1962 as amended, **accurately and consistently to correlate measurements made of the noise output of diesel-engined vehicles in a free acceleration static test with those obtained from the British Standard drive-past test.** Provided that the surface of the ground within the test area is free from such sound-absorbing material as powdery snow or loose soil, that there are no substantial obstructions or resonating surfaces in or very close to the test site and that the ambient sound level is at least 10 dB(A) below that produced by the vehicle on test, **the test site can be as small an open area as 24 metres x 15 metres.**

46. This finding has important implications for the enforcement of Regulation 89 in relation to diesel-engined vehicles. Because of the small open area required for the test site, the procedure could be applied without great difficulty at heavy goods vehicle testing stations. The prospect of including a quick (probably 1½ minutes in duration), reliable and accurate noise check in the annual test for diesel engined heavy goods vehicles is very encouraging. The effectiveness of the annual test, in conjunction with roadside spot checks, in stimulating operators to improve maintenance of vehicles is well attested, and the inclusion of an instrumented noise check in the test would almost certainly serve to reduce considerably the number of heavy vehicles on the roads making excessive noise. **We therefore recommend that the Secretary of State should apply the instrumented static noise test at the annual test for diesel engined heavy goods vehicles as soon as possible.**

In order to achieve this it would be necessary for fresh Regulations to be made authorising the new procedure, and making it an offence for a vehicle to be used on the roads if it is capable of producing, under the static test procedure, noise exceeding the relevant limit. (We note, however, in passing, that the test procedure will need to be kept under review in the light of technological developments in the quietening of heavy diesel vehicles).

Extension to vehicles fitted with petrol engines

47. At its present stage of development the procedure for the noise testing of stationary vehicles is only suitable for vehicles powered by diesel engines. As the report at Annex E shows, there are technical difficulties in extending the static test procedure to petrol engines. This would require the development of an instrument designed to measure and control engine speed, so that under free acceleration conditions damage to the engine caused by over-revving and spurious noise due to valve bounce could be prevented. Only in this way can the test represent normal operating conditions. **We urge that further development work to enable the static test procedure to be applied to petrol engined vehicles should be carried out as quickly as possible.** We acknowledge that, given the limited facilities at present available at commercial testing stations it is not likely to be a practical proposition for an instrumented noise check to be introduced into the annual test for cars and motorcycles. But **if the review by the Minister for Transport Industries of the annual car and motorcycle testing scheme results in the creation of specialist testing stations, we would recommend that as soon as a satisfactory procedure for static testing of petrol engined vehicles has been established it should be incorporated in the annual car test.**

Spot Checks

48. **We consider it essential that—as was always intended—there should be provision for vehicles not complying with Regulation 89 to be detected** *in flagrante delicto* **on the roads. While therefore we see the principal application of the instrumented static test as being its inclusion in annual vehicle tests, we recommend that it should also be used to mount a continuing programme of roadside spot checks.** Its flexibility makes it well suited for use at sites just off the road, in larger lay-bys, car parks or other convenient places. Such a programme need not involve the deployment of scarce resources on a large scale. **The deterrent effect** (in this as in other fields) **of a relatively small number of random spot checks should be sufficient to make deep inroads into the number of vehicles which today infringe the Regulation.** It is interesting to note, by way of comparison, the effect of spot checking for smoke on heavy goods vehicles. Vehicle examiners are empowered in the case of seriously offending cases to issue a prohibition notice, while in less serious cases they may require the defect to be put right and the vehicle to be subjected to a further test. Of total vehicles checked in 1970 11.6% emitted excessive smoke, but in 1971 only 4.65% did so. Although other factors may have contributed marginally to this reduction, it is a fair inference that spot checks, in which particular attention was given to smoke in those two years, in conjunction with the annual test, have had a considerable deterrent effect.

49. We have in mind occasional checks at selected (but not pre-publicised) spots. The tests would be conducted by DOE's vehicle examiners assisted by the police—either as an integral part of the programme of spot checks already undertaken as part of the heavy goods vehicle scheme or (if the static test procedure can be made appropriate for petrol engined vehicles), as a special exercise covering all types of vehicles. Vehicles would be selected at random for checking. There would be no implication of guilt in being required to submit to a check and since the testing site would be adjacent to the road and the test itself would not take more than about 1½ minutes, there would be little loss of time or inconvenience for those selected. This procedure would thus not be open to the objections discussed above.

Education and publicity

50. The emphasis of this report has been, as the terms of reference require, on the enforcement of the Regulations controlling noise. But we would not like to leave unmentioned the advantages that might be derived from publicity and education. Almost everyone causes noise just as almost everyone suffers from it. The driver who revs up his engine unnecessarily or slams his door late at night, the vehicle owner who delays replacing his corroding exhaust silencer system, probably has no thought for the distress he is causing other people. Publicity could educate the public into recognising the consequences of such careless behaviour and may well thus encourage good citizenship and reduce the nuisance of traffic noise. Conversely it would help the situation if those who suffer from illegal noise from motor vehicles were to complain to the police, in order that they may take what action they can. In doing so, however, complainants should be aware that for their complaints to be effective they must be prepared if necessary to give evidence before the court. In the last resort the effectiveness of any law depends on the willing co-operation of the public, both in observing it and in helping its enforcement. In order to encourage such co-operation, **we recommend that the Government should initiate publicity to draw people's attention to the unnecessary suffering caused by the thoughtlessly noisy use of vehicles.**

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

Environmental management

51. The plans and policies that regulate the future pattern of urban structures are in the process of formulation now. We consider that noise control should be a primary consideration in the strategies of planning and highway authorities; and that plans (at both national and local level) for the building of new roads and the improvement of existing ones, and for the restriction or control of the use of vehicles on particular routes should be designed to take full advantage of opportunities for the alleviation of noise nuisance (paragraph 7).

52. We welcome, and commend to the Minister for Transport Industries, the recommendation of the Working Group on Lorry Parking that a national chain of lorry parks should be set up. This proposal offers the prospect of much needed relief from the noise nuisance caused by the starting up, in the early hours of the morning, of heavy goods vehicles parked indiscriminately in residential streets (paragraph 8).

Quieter vehicles

53. Any realistic programme to secure significant general reductions in vehicle noise must include measures directed to the development of quieter engines and vehicles (paragraph 10).

54. New and more severe noise limits for certain types of new vehicle have recently been announced. This tightening of the controls is a welcome next step, though it is disappointing that the time-lag is so great (paragraphs 18 and 19).

55. We are of the opinion that the Government itself should devote resources towards the research and development of quieter motorcycles; and we are glad to learn that a programme of Government sponsored research into motorcycle noise aimed at developing quieter motorcycles is at present being planned (paragraph 14).

56. We welcome the recently announced five year project for the development of a quiet heavy goods vehicle. We are advised that, if completed successfully, this should enable heavy goods vehicles with a maximum noise level of 80 dB(A) (quieter than the average car today) and a corresponding reduction in interior cab noise, to be mass produced by 1980. We urge that this project be given the highest priority (paragraph 15).

57. We warmly welcome the recently expressed intention of the Minister for Transport Industries to press, within the forum of the Economic Commission for Europe, for stricter international standards on noise (paragraph 20).

58. We welcome the announcement by the Minister of Transport Industries on 7 October 1971 that an effective system for enforcing the proposed new construction limits will be devised and applied (paragraph 24).

Silencers

59. We should like to see a much more intensive effort by the police to enforce the regulations on silencers (though we recognise that with all the demands made upon their limited resources there is a limit to what can be done). We should also like magistrates to exercise their discretion to impose heavier fines for these offences within the maximum of £50 prescribed by law (paragraph 30).

60. We consider that the Department of the Environment should examine urgently the possibility of introducing Regulations laying down a system of approval for vehicle silencers. The object of this would be to make it illegal to fit unsuitable or poor-quality silencer systems or those designed to emit an unreasonable amount of noise. The Department should also consider the possibility of devising Regulations which would make it illegal deliberately to sell ineffective silencer systems. In devising such a system of approval the Department should give attention to the possibility of setting minimum standards of durability for silencers (paragraph 31).

61. We think the Department of the Environment should, in the context of the recently announced review of the annual vehicle testing scheme, include in the annual test of all cars and motorcycles a visual check on the efficiency of the exhaust and silencer systems (paragraph 31).

Noise limits for vehicles in use

62. We regard the setting and enforcement of maximum permitted noise levels for vehicles in use as an essential component of any effective programme for the alleviation of nuisance from traffic noise. Unfortunately, however, the procedure prescribed in Regulation 89 for substantiating breaches of that Regulation has been found to present insuperable difficulties. We have therefore thought it right to investigate alternative methods of enforcement (paragraph 32).

Screening for test

63. We have in particular considered a scheme for directing owners of vehicles considered noisy by a police constable or other authorised officer to present their vehicles to a testing station. We feel, however, that there would be a deep-seated reluctance on the part of many vehicle owners to accept the judgement of a police constable or other authorised officer as a sufficient basis for putting them to the trouble of presenting their vehicle at a testing station. We therefore inquired into the possibility of cheap portable noise meters being supplied to patrolling policemen for initial screening. The Noise Abatement Society have sponsored the development of such a meter (the "Noise Torch") (paragraphs 33 and 35).

64. In its present form at least, the Noise Torch is not a suitable aid to law enforcement. Accurate portable noise meters do exist, but none of them is both light enough to be carried with comfort by patrolling policemen and cheap enough to be considered for general issue (paragraphs 37 and 38).

65. The concept of a portable screening device is none the less attractive and the possibility of developing one that meets all the requirements should not be overlooked (paragraph 38).

66. Even given a satisfactory instrument, however, the obtaining of reliable readings under operational conditions would present difficulties. In less than ideal conditions the scope for error would be substantial (paragraph 39).

67. If the cost and inconvenience of presenting a vehicle for noise testing is to be less than that involved in prosecution and conviction, testing facilities would have to be available at many thousands of locations throughout the country. However the physical conditions required for the form of test at present prescribed in Regulation 89 exist at few garages; and whatever alternative form of test might be devised for the purpose, it seems unlikely that sufficient open space and skilled staff would be available in more than a minority of these garages (paragraph 41).

Static testing

68. It is possible accurately and consistently to correlate measurements made of the noise output of diesel-engined vehicles in a free acceleration static test with those obtained from the British Standard drive-past test. The test site can be as small an open area as 24 metres x 15 metres (paragraph 45).

69. We recommend that the Secretary of State should apply the instrumented static noise test at the annual test for diesel engined heavy goods vehicles as soon as possible (paragraph 46).

70. We urge that further development work to enable the static test procedure to be applied to petrol engined vehicles should be carried out as quickly as possible (paragraph 47).

71. If the review by the Minister of Transport Industries of the annual car testing scheme results in the creation of specialist testing stations, we would recommend that as soon as a satisfactory procedure for static testing of petrol engined vehicles has been established it should be incorporated in the annual car test (paragraph 47).

Spot checks

72. We consider it essential that—as was always intended—there should be provision for vehicles not complying with Regulation 89 to be detected *in flagrante delicto* on the roads. While therefore we see the principal application of the instrumented static test as being its inclusion in annual

vehicle tests, we recommend that it should also be used to mount a continuing programme of roadside spot checks. The deterrent effect of a relatively small number of random spot checks should be sufficient to make deep inroads into the number of vehicles which today infringe the Regulation (paragraph 48).

Publicity

73. We recommend that the Government should initiate publicity to draw people's attention to the unnecessary suffering that is caused by the thoughtlessly noisy use of vehicles (paragraph 50).

ANNEXES

ANNEX A

EXTRACTS FROM MOTOR VEHICLES (CONSTRUCTION AND USE) REGULATIONS 1969

Audible warning instrument

21.—(1) Subject to the provisions of this Regulation, every motor vehicle shall be fitted with an instrument capable of giving audible and sufficient warning of its approach or position.

(2) Paragraph (1) of this Regulation shall not apply to a works truck or a pedestrian controlled vehicle.

(3) Except as provided in paragraphs (4) and (5) of this Regulation, no motor vehicle shall be fitted with a gong, bell, siren or two-tone horn.

(4) The following vehicles may be fitted with a gong, bell, siren or two-tone horn—

(*a*) motor vehicles used for fire brigade, ambulance or police purposes,

(*b*) motor vehicles owned by a body formed primarily for the purposes of fire salvage and used for those or similar purposes;

(*c*) motor vehicles owned by the Forestry Commission or by local authorities and used from time to time for the purposes of fighting fires;

(*d*) motor vehicles owned by the Secretary of State for Defence and used for the purposes of the disposal of bombs or explosives;

(*e*) motor vehicles used for the purposes of the Blood Transfusion Service under Part II of the National Health Service Act 1946 or under Part II of the National Health Service (Scotland) Act 1947;

(*f*) motor vehicles used by Her Majesty's Coastguard or the Coast Life Saving Corps to aid persons in danger or vessels in distress on or near the coast, and

(*g*) motor vehicles owned by the National Coal Board and used for the purposes of rescue operations at mines.

(5) A motor vehicle used for the conveyance of goods for sale from the vehicle may, if it is also fitted with an instrument or apparatus for the purpose of complying with paragraph (1) of this Regulation, be fitted with an instrument or apparatus other than a two-tone horn designed to emit a sound for the purpose of informing members of the public that goods are on the vehicle for sale.

(6) References in paragraphs (3) and (4) of this Regulation to a gong, bell or siren include references to any instrument or apparatus capable of emitting a sound similar to that emitted by a gong, bell or siren.

Silencer

22.—(1) Every vehicle propelled by an internal combustion engine shall be fitted with a silencer, expansion chamber or other contrivance suitable and sufficient for reducing as far as may be reasonable the noise caused by the escape of the exhaust gases from the engine.

Noise

23.—(1) Except as provided in the next following paragraph of this Regulation, every motor vehicle first used after 1st April 1970 shall be so constructed that, at a time when the noise emitted by it is measured under the specified conditions by an apparatus of the kind prescribed by paragraph (3) of this Regulation, the sound level (A weighting) in decibels indicated by that apparatus in relation to the said noise so measured does not exceed the sound level which appears in Column 2 of Schedule 9 as the maximum sound level (A weighting) in decibels permitted for the relevant class or description of vehicle shown against that sound level in Column 1 of that Schedule.

(2) This Regulation shall not apply—

(*a*) to a motor vehicle proceeding to a place where, by previous arrangement—

(i) noise emitted by it is about to be measured for the purpose of ascertaining whether or not that vehicle complies with this Regulation, or

(ii) the vehicle is about to be mechanically adjusted, modified or equipped for the purpose of securing that it so complies, or

(*b*) to a motor vehicle returning from such a place immediately after the noise has been so measured, or the vehicle has been so adjusted, modified or equipped, or

(*c*) to a road roller.

(3) The apparatus prescribed for the purposes of paragraph (1) of this Regulation shall be a noise meter—

(*a*) which, at the time when it is used for those purposes, is in good working order and complies with the requirements laid down by the British Standards Institution for vehicle noise meters in Part I of the British Standards Specification for Sound Level Meters published on 7th September 1962 under the number BS 3539: 1962, as amended by Amendment Slip No. 1 numbered AMD22 and published on 1st July 1968, and

(*b*) which has, not more than 12 months before the date of the measurement made in accordance with the said paragraph (1), undergone all the tests for checking calibration applicable in accordance with the Appendix to the said British Standard Specification, and

(*c*) in respect of which there has been issued by the National Physical Laboratory, the British Standards Institution or the Minister a certificate recording the date on which as a result of those tests the meter was found to comply with the requirements of clauses 8 and 9 of the said British Standard Specification.

(4) In this Regulation, "the specified conditions" means the method of measuring the noise emitted by motor vehicles (excluding signalling devices) which is described by the British Standard Method for the Measurement of

Annex A

Noise Emitted by Motor Vehicles published on 24th June 1966 under the number BS 3425: 1966.

(5) The definition of sound level (A weighting) in decibels contained in clause 2 of the British Standard numbered BS 3539: 1962, as amended by the said Amendment Slip No. 1, shall apply for the purposes of this Regulation and Schedule 9.

Use and maintenance of silencer

82.—(1) No person shall use or cause or permit to be used on a road any vehicle propelled by an internal combustion engine so that the exhaust gases from the engine escape into the atmosphere without first passing through the silencer, expansion chamber or other contrivance required by these Regulations to be fitted.

(2) Every such silencer, expansion chamber or other contrivance shall at all times while the vehicle is used on a road be maintained in good and efficient working order and shall not have been altered in such a way that the noise caused by the escape of the exhaust gases is made greater by the alteration.

Excessive noise

87. No person shall use or cause or permit to be used on a road any motor vehicle or trailer which causes any excessive noise:

Provided that it shall be a good defence to proceedings taken in respect of a contravention of this Regulation—

(i) to prove that the noise or continuance of the noise in respect of which the proceedings are taken was due to some temporary or accidental cause and could not have been prevented by the exercise of due diligence and care on the part of the owner or driver of the motor vehicle, or

(ii) in the case of proceedings against the driver or person in charge of the motor vehicle who is not the owner thereof, to prove that the noise arose through a defect in design or construction of the motor vehicle or trailer or through the negligence or fault of some other person whose duty it was to keep the motor vehicle or trailer in proper condition or in a proper state of repair or adjustment or properly to pack or adjust the load of such motor vehicle or trailer as the case may be and could not have been prevented by the exercise of reasonable diligence and care on the part of such driver or other person in charge of the motor vehicle.

88. No motor vehicle shall be used on a road in such manner as to cause any excessive noise which could have been avoided by the exercise of reasonable care on the part of the driver.

Limitation of noise by measurement

89.—(1) Except as provided in paragraph (4) of this Regulation, this

Regulation applies to any vehicle which is a motor vehicle first used on or after 1st January 1931 or which is a trailer.

(2) Subject to the following provisions of this Regulation, no person shall use or cause or permit to be used on a road any vehicle to which this Regulation applies if—

(*a*) at a time when the noise emitted by that vehicle is measured under the conditions set out in Schedule 10 by an apparatus of the kind prescribed by paragraph (5) of this Regulation, there is indicated by that apparatus in relation to the said noise so measured a sound level (A weighting) in decibels which exceeds the maximum sound level permitted in relation to that vehicle by the next following paragraph, and

(*b*) the sound level of such noise as is described in paragraph 4 of Schedule 10 when measured in accordance with the provisions of that paragraph is found to be at least 10 decibels (A weighting) below the sound level indicated as hereinbefore provided by the said apparatus in relation to the noise emitted by the vehicle.

(3) The maximum permitted sound level for the purposes of the last preceding paragraph shall be—

(*a*) if the vehicle to which this Regulation applies is a motor vehicle first used before 1st November 1970, the sound level (A weighting) in decibels which appears in Column 3 of Schedule 9 as the maximum sound level permitted for the relevant class or description of vehicle shown against that sound level in Column 1 of that Schedule, and

(*b*) if the vehicle to which this Regulation applies is a motor vehicle first used on or after 1st November 1970, the sound level (A weighting) in decibels which appears in Column 4 of Schedule 9 as the maximum sound level permitted for the relevant class or description of vehicle shown against that sound level in Column 1 of that Schedule.

(4) This Regulation shall not apply—

(*a*) to a motor vehicle proceeding to a place where, by previous arrangement—

(i) noise emitted by it is about to be measured for the purpose of ascertaining whether or not that vehicle complies with Regula- 23, or

(ii) the vehicle is about to be mechanically adjusted, modified or equipped for the purpose of securing that it so complies, or

(*b*) to a motor vehicle returning from such a place immediately after the noise has been so measured, or the vehicle has been so adjusted, modified or equipped, or

(*c*) to a vehicle at a time when it is stationary otherwise than through enforced stoppage owing to the necessities of traffic and at the same time Regulation 90, by virtue of the proviso thereto, does not apply in relation to that vehicle, or

(*d*) to a motor vehicle first used before the date mentioned in paragraph (3)(*a*) of this Regulation at a time when an exhaust brake with which that vehicle is fitted is in operation, or

(*e*) to a road roller.

(5) The apparatus prescribed for the purposes of paragraph (2) of this Regulation shall be a noise meter of the same kind as that prescribed for the purposes of paragraph (1) of Regulation 23 and paragraph (3) of that Regulation shall have effect in relation to this Regulation as if any references therein to paragraph (1) of Regulation 23 were references to paragraph (2) of this Regulation.

(6) It shall be a good defence to proceedings taken in respect of the use of a vehicle which does not comply with this Regulation to prove the matters which would, by virtue of either proviso (i) or proviso (ii) to Regulation 87, constitute a good defence to proceedings taken in respect of the use of a motor vehicle which does not comply with that Regulation.

(7) The definition of sound level (A weighting) in decibels specified in Regulation 23 (5) shall apply for the purposes of this Regulation and Schedules 9 and 10.

(8) In this Regulation and Schedule 10, any reference to noise emitted by a vehicle shall be construed as including a reference to noise howsoever arising which is attributable to any load, burden or goods carried on or by the vehicle or to anything (other than an audible warning instrument fitted in accordance with Regulation 21(1) or an instrument or apparatus fitted in accordance with Regulation 21(5) fitted to it, or attributable to the manner in which the vehicle is loaded or fitted.

(9) Where any motor vehicle to which this Regulation applies is drawing a trailer, this Regulation and Schedules 9 and 10 shall have effect in relation to that motor vehicle as if any reference to it were a reference both to the motor vehicle and to the trailer drawn thereby.

Stopping of engine when stationary

90. The driver of every motor vehicle shall, when the vehicle is stationary otherwise than through enforced stoppage owing to the necessities of traffic, stop the action of any machinery attached to or forming part of such vehicle so far as may be necessary for the prevention of noise:

Providing that this Regulation shall not apply—

(a) so as to prevent the examination or working of the machinery attached to or forming part of a motor vehicle where any such examination or working is rendered necessary by any failure or derangement of the said machinery or where the machinery attached to or forming part of the vehicle is required to be worked for some ancillary purpose; or

(*b*) in the case of a motor vehicle which is propelled by gas produced in plant carried on the vehicle or on a trailer drawn by the vehicle.

Use of audible warning instruments

91.—(1) Subject to the provisions of this Regulation, no person shall—

(*a*) in the case of a vehicle which is stationary on a road, at any time; or

(*b*) in the case of a vehicle which is in motion on a restricted road, between the hours of 11.30 in the evening and 7 in the following morning,

sound or cause or permit to be sounded any instrument or apparatus fitted to or otherwise carried on the vehicle, being an instrument or apparatus capable of giving audible and sufficient warning of its approach or position.

(2) Subject to the provisions of this Regulation and without prejudice to the provisions of the foregoing paragraph, no person shall sound or cause or permit to be sounded a gong, bell, siren, any instrument or apparatus capable of making a sound similar to that emitted by a gong, bell or siren, or a two-tone horn, fitted to or otherwise carried on a vehicle (whether it is stationary or not).

(3) Nothing in paragraph (1) or (2) of this Regulation shall have effect to prevent the sounding of an instrument or apparatus fitted to, or otherwise carried on, a vehicle at a time when the vehicle is being used for one of the relevant purposes specified in Regulation 21(4) and it is necessary or desirable to do so either to indicate to other road users the urgency of the purposes for which the vehicle is being used, or to warn other road users of the presence of the vehicle on the road.

(4) Nothing in paragraph (1) of this Regulation shall have effect to prevent the driver of a vehicle or some other authorised person sounding or causing or permitting to be sounded an instrument or apparatus fitted to or otherwise carried on the vehicle if it is sounded for the purpose of raising an alarm as to the theft or attempted theft of the vehicle or its contents.

(5) Subject to the provisions of section 2(1) and (3) of the Noise Abatement Act 1960 and notwithstanding the provisions of paragraph (2) of this Regulation, a person may sound or cause or permit to be sounded an instrument or apparatus other than a two-tone horn fitted to or otherwise carried on a vehicle, being an instrument or apparatus designed to emit a sound for the purpose of informing members of the public that the vehicle is conveying goods for sale, if—

(*a*) when the instrument is sounded, it is sounded only for that purpose; and

(*b*) in a case where a vehicle is on a restricted road, the instrument is sounded otherwise than between the hours of 11.30 in the evening and 7 in the following morning.

(6) In this Regulation:—

"restricted road" means a length of road—

(*a*) on which there is provided a system of street lighting furnished by means of lamps placed not more than 200 yards apart, or

(*b*) as respects which there is in force a direction under section 72(3) of the Road Traffic Regulation Act 1967 that the said length shall become a restricted road for the purposes of section 71 of that Act or a direction under section 1(4) of the Road Traffic Act 1934 which, by virtue of paragraphs 1 and 10 of Schedule 8 to the said Act of 1967, has effect under that Act as such a direction as aforesaid.

SCHEDULE 9

Maximum Sound Levels (A weighting) in Decibels (dBA)

Column 1	Column 2	Column 3	Column 4
Class or description of vehicle	Regulation 23 Maximum (dBA)	Regulation 89 (3)(*a*) Maximum (dBA)	Regulation 89 (3)(*b*) Maximum (dBA)
1. Motor cycle of which the cylinder capacity of the engine does not exceed 50 cubic centimetres	77	80	80
2. Motor cycle of which the said cylinder capacity exceeds 125 cubic centimetres	86	90	89
3. Any other motor cycle	82	90	85
4. Goods vehicle to which Regulation 30 applies and which is equipped with a plate complying with the requirements of paragraph (2) of that Regulation and showing particulars of a maximum gross weight of more than 3½ tons	89	92	92
5. Goods vehicle first used before 1st January 1968 which complies with the requirements of Regulation 71 (3)(*c*) and is equipped with such a plate as aforesaid notwithstanding that Regulation 30 does not apply to that vehicle by reason only that it was so first used		92	

Column 1	Column 2	Column 3	Column 4
Class or description of vehicle	Regulation 23 Maximum (dBA)	Regulation 89 (3)(*a*) Maximum (dBA)	Regulation 89 (3)(*b*) Maximum (dBA)
6. Motor tractor	89	92	92
7. Locomotive	89	92	92
8. Land tractor	89	92	92
9. Works truck	89	92	92
10. Engineering plant	89	92	92
11. Passenger vehicle constructed for the carriage of more than 12 passengers exclusive of the driver	89	92	92
12. Any other passenger vehicle	84	87	87
13. Motor car within the meaning of section 253(2)(*b*) of the 1960 Act not being a goods vehicle of either of the kinds described in paragraphs 4 and 5 of this column	85	88	88
14. Any other vehicle not elsewhere classified or described in this column	85	92	88

SCHEDULE 10

Conditions mentioned in Regulation 89(2)

1. At the time when the noise emitted by the vehicle is measured, the microphone of the apparatus shall be so placed that the top of the microphone is set at a height of not less than 3 feet 9 inches and not more than 4 feet 1 inch above a point at ground level which is not less than 17 feet away from the nearest part of the carriageway on which the vehicle is being used.

2.—(1) For the purposes of this paragraph, the area in the vicinity of the microphone shall be treated as comprising areas the situation and extent of which shall be determined by reference to a line joining a point at ground level above which the microphone is placed to the said nearest part of the carriageway and in accordance with the diagram at the end of this Schedule including the directions contained therein; and the said areas shown marked I, II, III or IV on the said diagram are hereafter in this Schedule respectively referred to as the areas so marked.

(2) At the time when the noise is measured there shall not be:—

(*a*) in the area marked I, any physical object higher than 2 feet above ground level;

(*b*) in the area marked II, any physical object higher than 3 feet above ground level; and

(*c*) in the areas marked III or IV, any physical object higher than 5 feet above ground level;

Provided that the requirements at (*c*) above shall not apply in relation to the following objects or to any of them, that is to say:

(i) to plants, shrubs, trees or any other kind of vegetation, or

(ii) to any physical object, of which a continuous surface less than 1 foot wide over all its height would be visible in daylight, to a person looking at it from the point above which the microphone is placed and whose eye level is at the height of the microphone.

(3) For the purpose of sub-paragraph (2) of this paragraph, neither the vehicle nor any part thereof, nor any person nor thing in or on the vehicle, nor the apparatus nor any part thereof, nor any persons being less than 3 in number attending the apparatus, shall be taken into account.

3. At the time when the noise emitted by the vehicle is measured, the vehicle shall be wholly or partly on a part of the road which falls within the area marked IV on the said diagram.

4. As soon as the vehicle has left the area marked IV on the said diagram the apparatus shall be used to measure the sound level (A weighting) in decibels of such noise as is then capable of affecting the sound level indications of the apparatus, such measurement being carried out in the manner in which the measurement of the sound emitted by the vehicle was carried out and under the conditions applicable under the foregoing provisions of this Schedule, excluding paragraphs 2(2)(*c*) and 3.

DIAGRAM

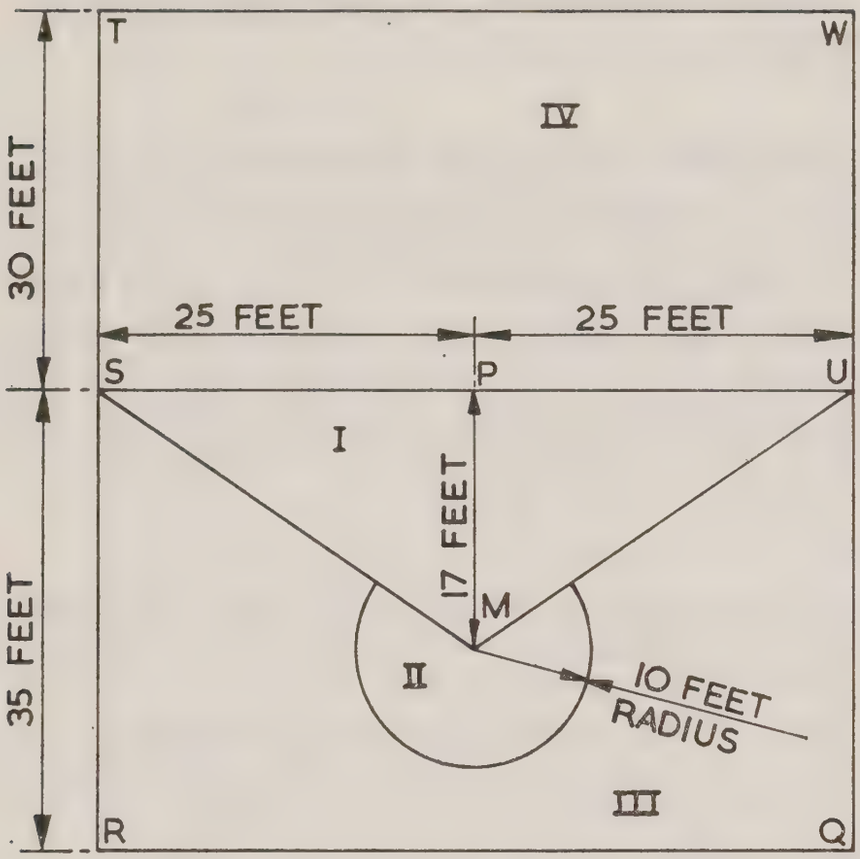

DIAGRAM DIRECTIONS (including Key and Dimensions)

M a point at ground level above which the microphone is placed.

P the nearest part of the carriageway to the microphone.

The area marked I consists of the triangle MSU.

The area marked II consists of so much of the circle of radius 10 feet with centre at M as does not enclose any part of the area marked I.

The area marked III consists of so much of the rectangle RSUQ as does not enclose any parts of the areas marked I or II.

The area marked IV consists of the rectangle STWU.

DIMENSIONS.

The distance MP is not less than 17 feet.
The lengths of SR, and UQ are each 35 feet.
The lengths of TW, SU and RQ are each 50 feet.
The lengths of SP and PU are each 25 feet.
The lengths of TS and WU are each 30 feet.

APPENDIX. I.
FIGURE. I.
ME REPORT No. 202

ANNEX B

SURVEY BY THE VEHICLE ENGINEERING AND INSPECTION DIRECTORATE DEPARTMENT OF THE ENVIRONMENT, OF VEHICLES BEING USED WITH DEFECTIVE OR INEFFECTIVE EXHAUST SILENCERS.

1 Introduction

1.1 At the December 1970 meeting of the NAC the DOE representative presented a paper describing vehicle noise regulations and methods for their enforcement (NAC(70)18. The control of noise from road vehicles). Following the presentation of this paper the suggestion was made that further evidence was required of the number of vehicles being used with defective or unduly noisy exhaust systems. The Vehicle Engineering Division of DOE undertook the organisation of a survey to provide the information required. This note reports the results of the survey.

2 Object of survey

2.1 To examine a representative sample of the road traffic population and determine the proportion of the population with defective or ineffective exhaust systems.

2.2 For the purpose of the survey a defective or ineffective exhaust system is defined as an exhaust system emitting noise considerably in excess of the noise level normally expected for the type of vehicle being examined.

3 Method of conducting the survey

3.1 The use of a quantitative method using instruments was rejected because of the difficulty in differentiating between the noise emitted by the exhaust system and that emitted by other parts of the vehicle. Also present measuring techniques do not permit the noise emitted by a particular vehicle to be isolated from the general traffic noise in situations where there is heavy traffic flow.

3.2 It was decided that the subjective judgement of experienced observers would be the most suitable method of assessing the noise emitted by exhaust systems. This technique had the merit of being similar to the assessment made by the man in the street with the advantage that the experienced observer would differentiate between normal and excessive noise.

3.3 To obtain a representative sample of the traffic population the survey was based on observers reports from locations in England, Scotland and Wales.

3.4 The experienced observers were provided from the staff of Vehicle Inspection Division in each of the DOE Traffic Areas. These Traffic Areas divide England, Scotland and Wales into eleven regions. In all the Traffic Areas provided observers at 45 sites.

3.5 The engineers in charge of the Traffic Areas arranged for three man-days of subjective observation at sites where a heavy traffic flow could be expected.

3.6 The observers were asked to catalogue the traffic into four classes:—

(a) Motor cars

(b) Motor cycles and three-wheeled vehicles

(c) Light vans

(d) Heavy goods vehicles (including buses)

The observers noted the total number of vehicles in each class and the number of vehicles in each class that were judged to be excessively noisy. (As defined in paragraph 2.2).

3.7 It was considered that certain special traffic conditions should be the subject of a separate series of observations.

3.8 The traffic conditions considered to be of special interest were, the London commuter traffic and those traffic conditions which, intuitively were considered likely to have a high proportion of noisy vehicles. Such traffic conditions were probable in areas where vehicles are used for short journeys (ie shopping areas and industrial estates) and at motor sport meetings.

3.9 To cover these special traffic conditions staff of the Vehicle Engineering Division carried out surveys outside normal working hours (ie early morning, late evening and at weekends).

3.10 To supplement the information obtained from the subjective survey the DOE Vehicles Testing Station, Hendon was asked to report on the exhaust system faults observed during the visual examination of cars and light vans under the vehicle testing scheme.

4 Results of survey

4.1 The subjective survey was carried out between 12 and 26 February 71, Traffic Areas choosing a period that suited their existing engineering commitments. Reports were received from 45 sites in Traffic Areas.

4.2 Special surveys were made during the periods 0700-0900 hours and 1600-1800 hrs daily, weekend surveys being made on Saturday morning or at a time appropriate to the event. Observations were made at 36 sites in London and the Home Counties.

4.3 The observations from the Traffic Areas and the special survey teams are summarised in Table 1.

4.4 The percentages of defective exhaust systems observed at sites in the Traffic Areas are shown in Table 2.

4.5 The percentages of defective exhaust systems observed by the special survey teams are shown in Table 3.

4.6 Table 4 summarises the defects in exhaust systems observed during inspections at the Vehicle Testing Station Hendon.

5 Discussion of results

5.1 A total of 5380 vehicles (see table 1) was judged to have defective or

ineffective silencers. Of the 5380 vehicles with noisy silencers 45% were heavy goods vehicles, 35% motor cars, 16% light vans and 4% motor cycles.

5.2 The vehicles with noisy silencers represented about 2½% of the 223,000 vehicles observed.

5.3 The results from the Traffic Areas showed a considerable variation between sites in the proportions of vehicles judged to have noisy silencers. There was less variation between results in Table 3 this is attributed to the more uniform interpretation of the objective by this group of observers.

5.4 Although the two groups of observers did not agree on the proportion of noisy silencers in each class of vehicles (see Table 1) there was agreement on the order of classes having noisy silencers. The motor cycle class was judged to have the highest proportion of noisy silencers, followed by the heavy goods vehicle class, light van class and finally the car class.

5.5 The results of the special surveys show that the proportion of cars with noisy silencers remained substantially constant and was independent of the type of traffic observed. There was a higher proportion of motor cycles with noisy silencers in shopping areas and industrial estates. The highest proportion of light vans with noisy silencers was observed at motor sport events.

5.6 The Vehicle Testing Station Hendon reported that 2.9% of the cars presented for inspection had exhaust system faults that could increase the noise emitted by the system. The proportion of silencer faults is higher than the proportion of cars with noisy silencers noted in the subjective surveys. The examination at Hendon is a visual inspection of the exhaust system, some of the faults reported may not contribute significantly to the noise emitted by the exhaust system.

5.7 Heavy goods vehicles are subject to an annual inspection under the testing scheme operated by Vehicle Inspection Division. Vehicle Inspection defect analysis show that 2.66% of the goods vehicles tested have exhaust system defects.

6 Conclusions

6.1 The results of the survey showed that about 2½% of the vehicles observed were judged to have defective or ineffective exhaust silencers.

6.2 Of the vehicles judged to be noisy 45% were heavy goods vehicles. This class of vehicle is subject to an annual inspection under the heavy goods vehicle testing scheme, therefore it is to be expected that the silencer defects noted on this class of vehicle will be rectified within 12 months.

6.3 If the heavy goods vehicles are deleted from the number of defective vehicles the proportion of defective vehicles falls to 1.35% of the total observed.

6.4 The 1970 census of motor vehicles shows that there are approximately M 11.5 cars, M 1.1 motor cycles and three-wheeled vehicles, M 1.1 light vans and M O .4 heavy goods vehicles of over 3 tons unladen weight. The total number of vehicles in these four classes is M 14.1.

6.5 Extending the results of the survey (table 1c) to the census figures approximately 268,000 vehicles can be assumed to be operating with defective or ineffective exhaust silencers. The police make about 12,000 prosecutions a year under regulations relating to excessive noise (Reg 87 and 88) and this figure represents only about 4½% of the vehicles that can be assumed to be operating with defective or ineffective silencers. The effort applied by the police under Regulation 87 and 88 is insufficient and, clearly, there is a case to investigate other methods of enforcement.

Table 1 SUMMARY OF RESULTS OF SUBJECTIVE SURVEY.

(a). **Traffic Areas**

	CARS	MOTOR CYCLES	VANS	HGV.
No. of vehicles observed	93,124	1,165	20,972	35,099
No. of vehicles with excessively noisy exhaust systems	1,309	131	739	2,294
Percentage of Class	1·4%	11·24%	3·52%	6·53%

(b). **VE2 Special surveys**

	CARS	MOTOR CYCLES	VANS	HGV.
No. of vehicles observed	56,365	2,641	8,186	5,648
No. of vehicles with excessively noisy exhaust systems	555	106	141	105
Percentage of Class	0·98%	4·01%	1·72%	1·86%

(c). **Combined results**

	CARS	MOTOR CYCLES	VANS	HGV.
NO. OF VEHICLES OBSERVED	149,489	3,806	29,158	40,747
NO. OF VEHICLES WITH EXCESSIVELY NOISY EXHAUST SYSTEMS	1,864	237	880	2,399
PERCENTAGE OF CLASS	1·22%	6·25%	3%	5·9%

Annex B

Table 2 PERCENTAGE OF VEHICLES WITH EXCESSIVELY NOISY EXHAUST SYSTEMS RECORDED IN TRAFFIC AREAS.

PERCENTAGE OF VEHICLE CLASS JUDGED TO BE EXCESSIVELY NOISY

SITE NO.	LOCATION	CARS	MOTOR CYCLES	LIGHT VANS	HGV.
1	E.Midland Motorway	0·5	28·5	0·9	8·3
2	E.Midland City Traffic	1·8	23·5	5	12
3	E.Midland City Traffic	6·8	4	2·7	3·9
4	N.Western TA Town Traffic	0	0	0	2·2
5	N.Western TA City Traffic	1·1	8	2·6	6·2
6	N.Western TA Trunk Road	0·05	0	0·05	2·7
7	Western TA City Traffic	8·6	41	21·5	19
8	Western TA Motorway	5·7	0	12·4	18·8
9	Western TA Town Traffic	5·3	30	9·5	29
10	Western TA Trunk Road	1·5	14	2·3	16
11	Western TA City Traffic	1	11	2·5	11
12	Western TA Trunk Road	0·5	0	0·4	1·8
13	W.Midland TA Urban Trunk	0·6	4·5	1·3	1·9
14	W.Midland TA City Traffic	0·4	5·6	0·5	1
15	W.Midland TA Urban Trunk Road	0·6	11	0·15	3
16	S.Wales TA City Traffic	0·6	16	3·7	2·9
17	S.Wales TA City Traffic	1	21·5	4·2	6·7
18	S.Wales TA Trunk Road	0·2	0	0	9·4
19	S.Wales TA Trunk Road	2·6	21·5	3	17·2
20	S.Wales TA Town Traffic	1·6	20	3·1	21
21	S.Eastern TA Trunk Road	3·2	0	3	0·8
22	S.Eastern TA Trunk Road	0·8	4·2	3·5	0·5
23	S.Eastern TA Trunk Road	0·3	0	1·0	1·4
24	Yorkshire TA Trunk Road	0·3	0	0·1	1·2
25	Yorkshire TA Town Traffic	0·4	22	1·0	5·9
26	Yorkshire TA City Traffic	1	12·5	0·9	1·8
27	Scottish TA City Traffic	0·7	35	1	6·3
28	Scottish TA City Traffic	2·7	14·2	6·1	7·2
29	Scottish TA City Traffic	1·9	0	2·3	4·25
30	Eastern TA Trunk Road	1·8	3·3	7·9	7·1
31	Eastern TA Trunk Road	0·7	0	2·1	3·4
32	Eastern TA City Traffic	1·1	20·8	11·2	13·1
33	Eastern TA Motorway	0·3	0	0·8	1·1
34	Eastern TA Trunk Road	2·9	19·5	4·2	10·6
35	Eastern TA Trunk Road	1·6	0	1·1	1·4
36	Northern TA City Traffic	1·1	24	5	14·6
37	Northern TA City Traffic	0·9	4·8	2·8	7·4
38	Northern TA City Traffic	0·8	4·8	2	2
39	Northern TA Trunk Road	17·6	25	19·2	39·5*
40	Northern TA Trunk Road	0·9	0	0	8·3
41	Met. TA Trunk Road	0·3	0	NC	0·2
42	Met. TA Trunk Road	0·4	8·4	NC	0·5
43	Met. TA Trunk Road	0	0	NC	0·3
44	Met. TA Motorway	0·3	0	NC	0·5

* these figures are suspect.
NC=not counted.

Table 3 PERCENTAGE OF VEHICLES WITH EXCESSIVELY NOISY EXHAUST SYSTEMS RECORDED DURING SURVEYS

PERCENT OF VEHICLE CLASS JUDGED TO BE EXCESSIVELY NOISY

SITE NO.	LOCATION	CARS	MOTOR CYCLES	LIGHT VANS	HGV.
45	London Commuter Traffic	0·1	0	0·3	0·3
46	London Commuter Traffic	0	0·7	0	0
47	London Shopping Area	0·04	0·9	0	0
48	Suburb Commuter Traffic	0·5	1·6	0·3	1·4
49	S.E. Town Shopping Traffic	0·4	4	1·3	0·5
50	S.E. Town Shopping Traffic	0·1	0	0	1·7
51	S.E. Town Housing Estate	0·6	0	0	0
52	S.E. Trunk Roads Industrial	1·4	8·7	1	4·2
53	Suburb Commuter Traffic	0·7	11	0·6	1·25
54	London Trunk Road	1·4	4	2·5	2·9
55	S.E. Commuter Traffic	2·1	4·4	4·6	4·6
56	London Commuter Traffic	1·5	3	0·6	0
57	Suburb Industrial Commuter Traffic	0·5	0	1·1	1·8
58	S.E. Commuter Traffic	1·4	1·7	2·6	2·2
59	S.E. Trunk Road	2·3	6·9	4·1	3·5
60	New Town Ind. Commuter	1·7	23	1·9	3·4
61	S.E. Trunk Road	0·6	1·5	2·1	0
62	London Trunk Road	2·5	6·6	4·3	2·75
63	Suburb Ind. Commuter	0·7	9·7	1·3	1·6
64	S.E. Commuter	0·6	7·3	2	8
65	Suburb Ind. Commuter	2·3	1·3	3·6	3·3
66	S.E. Commuter	1·5	4	3·3	0
67	S.E. Town Shopping Traffic	1	1·1	2·3	4·2
68	S.E. Town Shopping Traffic	0·7	8·4	1·4	8·4
69	S.E. Town Shopping Traffic S.E. Coast Plus	2·5	5·9	4·4	0
70	S.E. Motor Sport Traffic	0·8	0	6·7	1·4
71	S.E. Commuter Traffic	2·6	7·7	2·6	1·3
72	S.E. Ind. Commuter	1·9	11·5	2·9	0
73	S.E. Commuter	0·8	4·3	1·3	1·6
74	London Commuter & Trunk	2·5	3·3	2	3
75	S.E. Town Commuter & Farming	4	0	6	0
76	S.E. Motorway	0·4	0	0	1·5
77	Suburb Ind. & Commuter	1	5·2	2·9	4·5
78	London Commuter & Trunk	0·1	0·7	0·3	1
79	S.E. Town WE Shopping	2·5	5·5	0	0
80	S.E. W.E. Motor Sport	2·5	0	1·4	0

Annex B

Table 4 EXHAUST SYSTEM DEFECTS OBSERVED AT DOE VEHICLE TESTING STATION HENDON

	NO.	PERCENTAGE OF TOTAL
Vehicles Examined	969	
Corroded or Split Silencer Box	8	0·83%
Blowing at end of Silencer Box	14	1·45%
Downpipe and Manifold Defects	6	0·62%
Total Defects Influencing Noise Level	28	2·9%
Other Exhaust System Defects not Influencing Noise Level	13	1·34%

ANNEX C

ENFORCING ROAD VEHICLE MAXIMUM NOISE REGULATIONS

Proposals by the Noise Abatement Society

(Extracted from a memorandum submitted to the Minister of Transport in July 1970)

1. The Noise Abatement Society, whose members include some 600 Local Authorities, Trade Unions representing over 4m workers and large numbers of Residents' and other Associations, and whose work enjoys the support of the other great National Voluntary Organisations, has been very concerned about the quite unnecessary suffering caused to the general public by excessive noise from road vehicles. We have spent much money, time and effort in devising a practical system which provides a simple solution to the problem of enforcement and which for psychological reasons alone would greatly reduce traffic noise immediately it was put into effect.

2. The system is cheap, easy to operate and saves much valuable manpower.

3. It is envisaged that each Police Officer and Traffic Warden shall carry a small Noise Torch (about the size of a cigarette packet and weighing but a few ounces). If a noisy vehicle is heard the torch will light up if a preselected noise level is exceeded, indicating that under proper test conditions the vehicle may exceed the maximum noise level it is permitted under the Regulations.

4. Registration Number, Name of Proprietor and other identification, time, date and place would be noted. This Report would be posted to Central Registry who (after receiving three such Reports, to avoid any suggestion of individual discrimination) would instruct the owner of the vehicle to submit proof that his vehicle complies with the Regulations.

5. This he would do by taking the vehicle to his nearest Garage Testing Station, who would measure the noise under the new Static Tests devised by the Ministry of Transport and the Motor Industries Research Association, effect such repairs as may be necessary and issue the required Certificate, which of itself need cost no more than 50p.

6. Full scale electronic testing equipment to MOT and MIRA standards could be operated on any large forecourt. It costs about £1,250 to manufacture and could be rented to garages at a net weekly cost of about £3.50.

ANNEX D

ASSESSMENT OF THE NOISE SURVEY METER -

1 Introduction

1.1 The Noise Survey Meter is a low cost device which indicates by means of a signal lamp when a predetermined sound level has been exceeded. A switch enables the operator to set the threshold level of the signal lamp to the equivalent of sound levels of 70, 80 or 90 dB(A).

1.2 The low cost of these devices makes it possible to consider the possibility of distributing large numbers of these meters to the law enforcing agencies. This possibility has led to an investigation of the performance and utility of these devices.

1.3 Four samples of the Noise Survey Meter were purchased in November 1970 for evaluation. A programme was prepared to investigate the accuracy, reliability and robustness of these devices. The programme consisted of two parts, field trials (kerbside checks and comparison with conventional sound level meters when used for standard moving and stationary vehicle noise tests) and laboratory tests to check the accuracy and frequency response of the meters

1.4 During the evaluation programme adjustments and modifications were made to the meters by the manufacturers. These adjustments, which were made at the manufacturers request, improved the performance of the meters.

1.5 Having been modified by the manufacturers the four samples evaluated are not necessarily representative of the performance of the current production models. In view of this, a further four samples have been purchased (July 71) and subjected to checks for accuracy and frequency response.

2 Field trials I

2.1 Roadside checks.

2.1.1 Before commencing the tests the four meters were identified by marking each one with a letter of the alphabet (ABC&D).

2.1.2 These tests were intended to provide a comparison of the noise levels indicated by the Noise Survey Meters with the noise level measured by a precision sound level meter during a series of roadside checks.

2.1.3 The checks were based on the procedure for making roadside checks described in The Motor Vehicles (Construction and Use) Regulations 1969 Regulation 89 and Schedule 10. The measurements were made at a site in Central London. The site dimensions approximated to those specified in Schedule 10 of the Construction and Use Regulations.

2.1.4 The traffic passing the measuring site included a large number of commercial vehicles.

2.1.5 Initially, the Noise Survey Meters were placed adjacent to the microphone of the precision meter (ie 17 feet from the kerb). At this distance the Noise Survey Meters did not indicate that the noise level had exceeded 70dB(A) although the precision sound level meter had registered readings in excess of 80dB(A).

2.1.6 The Noise Survey Meters were re-positioned at the kerbside and in this position two of the meters responded to the noise emitted by slow moving vehicles. The noise levels indicated by the meters were 10-20dB(A) below the noise level registered by the precision sound level meter (17 ft further away from the source of noise).

2.1.7 The result of these tests showed that the response of the Noise Survey Meter was too sluggish to enable the noise level to be registered from any moving noise source.

2.2 Sterile site checks.

2.2.1 These checks were made at an acoustically sterile site and provided a mean of investigating the accuracy and repeatability of the instrument readings.

2.2.2 The standard method of assessing the noise level emitted by a motor vehicle is described in BS 3425: 1966 Method for Measurement of Noise emitted by Motor Vehicles.

2.2.3 Another method of assessing the noise level emitted by commercial vehicles is the stationary noise check described in DOE report ME201 August 1971: A Testing Procedure to measure the Noise Potential of Motor Vehicles at Space Restricted Sites.

2.2.4 Both methods of measuring vehicle noise were used to compare the performances of the Noise Survey Meters with the readings obtained from a precision sound level meter.

2.2.5 The response of the Noise Survey Meters was sluggish (section 2.1.6) and it was anticipated that the meters would not detect the noise level emitted by the vehicle in the BS 3425 test. This proved to be the case, at the standard distance of 7½m only one meter (D) detected a noise level in excess of the lowest range setting. This meter indicated a noise level between 70 and 80dB(A), the precision sound level meter reading was 92 dB(A).

2.2.6 These tests were repeated several times and although the measured noise level remained substantially constant the performance of meter D was erratic.

2.2.7 The Noise Survey Meters were then positioned at a distance of 3¼m from the centre line of the test track and the tests repeated. Again the results were erratic. With measured noise

levels of 91-92 dB(A) two Noise Survey Meters indicated noise levels in excess of 80 dB(A) but below 90 dB(A) (Meters C&D). Meter A did not respond at any range setting and Meter B indicated a noise in excess of 70dB(A) but below 80dB(A). Meter C while indicating a noise level in excess of 80dB(A) gave no indication when set to a range of 70dB(A).

2.2.8 Similar results were obtained when the noise level from a stationary vehicle was monitored.

3 Laboratory checks I

3.1 These checks were made by an independent testing authority.

3.2 The standard procedure for calibrating vehicle noise meters is specified in BS 3539.

3.3 The Noise Survey Meter does not have analogue indication of sound pressure levels and the standard calibration procedure cannot be applied to this type of instrument.

3.4 However, it was decided that a form of calibration could be achieved by exposing the Noise Survey Meters, to the frequency spectra specified in BS 3539 and noting the reading on the reference sound level at which the signal lamp of the Noise Survey Meter was illuminated

3.5 Two meters (A and C) were calibrated in this manner. The range switch settings were found to be between 8 and 27 dB(A) below the readings obtained from the reference meter.

4 Modifications

4.1 At the manufacturer's request three of the meters were returned to them for modifications to improve the response and accuracy of the meters. The fourth meter (meter C) was retained by DOE as a reference instrument.

5 Laboratory checks II

5.1 These checks were made by an independent testing authority.

5.2 After the manufacturer had modified meters A, B & D, meters A and B together with unmodified meter C were submitted for further Laboratory checks.

5.3 The errors in the scale settings of meters A and D had been reduced. For meter B the error was 5 dB(A) on the upper ranges and 10 dB(A) on the lower range. For meter D the error was approximately 5dB(A) on all ranges.

5.4 The opportunity was taken to re-calibrate meter C, an interval of 2 months having elapsed since the first calibration. The result obtained differed from the initial calibration by approximately 7dB(A) on the highest and lowest ranges and by 2dB(A) on the middle range.

5.5 The frequency response of meters A, C and D was compared with the international A weighted frequency spectrum (ie the dB(A) scale). The meters vary considerably from the A weighting curve.

6 Field trials II

6.1 Further moving and stationary vehicle noise tests were made on the sterile site using Noise Survey Meters AB and D.

6.2 The meters now registered noise levels when vehicles were driven past the microphone position indicating that an improvement in meter response time had been achieved.

6.3 The meters gave an underestimate of the vehicle noise level and were erratic in performance.

6.4 Similar results were obtained from the stationary vehicle noise checks.

7 Laboratory checks III

7.1 A further four samples of Noise Survey Meter were purchased and submitted for calibration and frequency response checks.

7.2 This new sample of meters differed from the original in two respects, a more positive action to the range switch and the provision of miniature potentiometers (one for each switch position) to set the range of the instrument.

7.3 The meters were supplied by the manufacturer without having been adjusted for accuracy of reading. The manufacturer's representative calibrated the meters prior to testing using the test laboratory's standard reference instruments. The accuracy obtained by this method was probably better than would be achieved using industrial calibration methods.

7.4 The following remarks are based on a report made by the independent testing authority.

7.5 The greatest calibration error was 5dB(A). Only one meter was accurate within $\pm$ 2dB for all three frequency spectra (see BS 3539) at all three switch positions.

7.6 The frequency response of all meters varied considerably from the A weighted curve.

7.7 The response time (the time taken from the initiation of the sound for the light to come on) varied from 0.05 seconds to 0.25 seconds depending upon the meter.

7.8 The use of separate potentiometers to set the range of each switch position results in the overall accuracy of the meter being dependent on the method of setting and the stability of these potentiometers. No provision is made for locking these potentiometers after setting and this increases the possibility of a change in calibration during use.

8 Designs and construction

8.1 The electronic components are mounted on a printed circuit board and contained in a moulded plastic case. No fault occurred in either the printed circuit board or case during the period of the test.

8.2 On the earlier versions of the Noise Survey Meter the action of the range change switch was not positive resulting in the meter being inadvertently switched on and discharging the battery. Later versions of the meter have a switch with a more positive action which may prove to be more serviceable.

8.3 Difficulty was experienced in maintaining an efficient connection to battery terminals. Loose connections in this circuit were the cause of intermittent meter faults.

8.4 Operators found difficulty in determining whether the signal lamp was on in conditions of bright sunlight.

9 Conclusions

9.1 The original version of the Noise Survey Meter failed to detect the noise level emitted by moving vehicles. After modification by the manufacturer the response of the meters to moving vehicle noise improved.

9.2 The measurement of moving vehicle noise with a Noise Survey Meter was erratic and the operator could not state with confidence that the noise level had not exceeded the selected range of the meter.

9.3 The accuracy and frequency response observed during the laboratory checks is to be expected from a low cost meter such as the Noise Survey Meter.

9.4 The erratic performance, the wide spread in calibration between samples and the shift in calibration with time make this instrument (in its present form) unsuitable for law enforcement purposes.

ANNEX E

British Standards Institution
Hemel Hempstead Centre
Maylands Avenue, Hemel Hempstead, Herts.

Report No. 5694, 26 July 1971
In respect of 4 noise survey meters marketed by the Noise Abatement Society and submitted for test by the Department of the Environment

[*NB the general and specific regulations of the BSI Test Centre (Test Leaflet No. TL.1) apply in all respects*]

INTRODUCTION

This Report details the results of testing 4 Noise Survey Meters marketed by the Noise Abatement Society. The meters were submitted by the Department of the Environment for evaluation of their characteristics under laboratory conditions.

The meters were supplied by the manufacturer without having been adjusted for accuracy of reading in the three switch positions and at our request the manufacturer's representative set the meters to read correctly immediately prior to testing using the test laboratory's standard reference instruments.

It was originally considered that the meters should be subjected to an electrical test to measure the accuracy of the attenuator steps between the 70, 80 and 90dB switch positions. However, the manufacturer's representative advised that any results from electrical tests would be meaningless as each meter is adjusted to suit the characteristics of its own microphone. Testing was, therefore, confined entirely to acoustical measurements.

Summary of Results

Attenuator Response—Acoustical

The greatest errors were observed with Meter No. 2 which was 5dB in error at the 70 and 80dB switch positions for the Y and Z spectra respectively. As can be seen from Table 1 the other meters were in general 1 or 2dB in error; the only meter found to be accurate within ±2dB for all three spectra at all three switch positions was Meter No. 1.

'A' Weighting Response

From the results listed in Table 2 it would appear that the maximum frequency range for the meters is from 160 to 6300Hz. However, even between these limits the meters vary considerably from the A weighting curve.

Response Time

As shown in Table 3 the response time under the conditions of test varied from 0.05 seconds for Meter No. 4 to 0.25 seconds for Meter No. 1.

Annex E

Method of Test

Attenuator Response—Acoustical

The accuracy of the attenuator response was measured using the steady noise spectra termed X, Y and Z and specified in Amendment No. 1 of B.S. 3539:1962.

The meters were set up in a reverberant sound field and under similar conditions were compared against a reference sound level meter, noting the sound pressure level for each switch position when the indicator light was judged to have reached maximum intensity.

'A' Weighting Response

Using 1/3 octave bands of noise in a reverberant sound field the sound pressure level was adjusted until, with the switch in the 70dB position, the indicator light was judged to be just visible and the level at each frequency compared against the level at 1000Hz.

The tests were limited to a maximum frequency range of 125 to 8000Hz with the switch in the 70dB position due to practical difficulties in obtaining sufficient amplitude to match the characteristics of the meter and its microphone.

Response Time

The time taken for the meters to respond after switching on a steady noise spectra was measured. The tests were completed in a non-reverberant room.

The X and Y spectra were set at sufficiently high sound pressure levels to allow for variations between the meters with the switch in the 70dB position; the time taken for the indicator light to reach maximum intensity after switching on the noise source was measured using a light sensitive resistor and a chart recorder. The mean of 12 readings (six with each spectra) was calculated.

It is not intended that the times given should be taken as the absolute response times for the meters tested because the response of the meters will to some extent depend on the ambient conditions and the sound pressure level at the time. The meters were tested under similar conditions and the results are indicative of the difference that can be expected between meters.

Table 1

Attenuator Response—Acoustical

Meter switch Position dB		Meter No. 1. dB(A)	2. dB(A)	3. dB(A)	4. dB(A)
70	X	71	74	72	72
	Y	69	**75**	74	71
	Z	**69**	74	72	71
80	X	79	82	80	**78**
	Y	79	83	81	79
	Z	78	**85**	80	81
90	X	89	**94**	91	88
	Y	89	93	92	**87**
	Z	90	93	90	89

Table 2

A Weighting Response

Mid Band Frequency Hz	Meters Nos. 1.	2.	3.	4.	Weighting Tolerances		
125	–37*	—*	–23*	–29*	–16·1	±3	
160	–30*	–20*	–17*	–20*	–13·2	±3	
200	–22*	–11	–12	–13	–10·8	±3	
250	–14*	– 1*	– 8	– 7	– 8·6	±3	
315	– 8	+ 5	– 1*	– 4	– 6·5	±3	
400	– 5	+ 8*	+ 3*	– 3	– 4·8	±3	
500	– 4	+ 9*	+ 9*	– 2	– 3·2	±3	
630	– 4	+ 7*	+ 9*	– 2	– 1·9	±3	
800	– 3	0	+ 3*	– 1	– 0·8	+2·5	
1000	0	0	0	0	0	±2	
1250	– 8*	+ 4*	+ 3	– 9*	0·6	±2·5	
1600	– 4*	+ 4	+ 3	– 4*	1·0	±3	
2000	0	+ 6*	+ 4*	– 3*	1·2	±3	
2500	+ 3	+12*	+14*	+ 4	1·2	+4	–3
3150	+ 1	– 6*	+13*	+ 3	1·2	+5	–3·5
4000	– 1	– 5*	+ 9*	+ 1	1·0	+5·5	–4
5000	– 6*	– 4	– 3	–11*	0·5	+6	–4·5
6300	–17*	– 9*	– 4	–15*	– 0·1	+6	–5
8000	–26*	–17*	– 8*	–20*	– 1·1	±6	

* These values are outside the tolerances for the A weighting curve.

Table 3

Response Time

	Meters Nos. 1.	2.	3.	4.
Mean Response Time seconds	0·25	0·10	0·15	0·05

ANNEX F

A TESTING PROCEDURE TO MEASURE THE NOISE POTENTIAL OF VEHICLES AT SPACE RESTRICTED SITES

Department of the Environment
Vehicle Engineering Division
Report No. ME 201

CONTENTS

5 Minimum dimensions of the test site
6 Sketch of automatic sampling read-out unit
7 Vehicle inspection pit marking
8 Layout of noise check grid
9 General layout of the test site

Report on the development of a test procedure to measure the noise potential of motor vehicles at space restricted sites

Abstract

The test procedure described in this Report has been evolved so as to be suitable for the measurement of individual vehicle noise without the need for an acoustically sterile site of a kind generally required for scientific measurement of sound level. The measurements of sound level made in accordance with this test procedure correlate well with those made to BS 3425: 1966 (and to ISO Recommendation No. R362) drive-past tests. The validity of the test procedure is conditional to the current dominance of engine exhaust noise. Masking of the noise from other sources in the moving vehicle is conducive to the adoption of a test procedure which uses the vehicle when stationary.

1 Introduction and background information

1.1 *Current Noise Regulations and their Enforcement*

1.1.1 Noise level limits and their enforcement by measurement were prescribed for the first time in the UK in regulations made on 15 March 1968 and the requirements are contained in the Motor Vehicles (Construction and Use) Regulations, SI 1969 No. 321, Regulations 23 and 89.

1.1.2 Regulation 23 relates to 'construction' limits which apply to motor vehicles first used after 1 April 1970. Noise level limits are prescribed for various categories of vehicle and measurement is made in accordance with the test procedure described in BS 3425: 1966.

1.1.3 Regulation 89 relates to 'use' limits and applies to any motor vehicle first used on or after 1 January 1931 and to any trailer. Vehicles in use have been required to meet prescribed noise level limits since 1 July 1968. The prescribed limits apply to roadside measurement and include an allowance appropriate to the minimum site dimensions and the ambient environment at the test site.

1.1.4 The measurement of individual vehicle noise at the roadside under Regulation 89 is not easy and there is reason to suppose that many vehicles in use do not meet the noise

limits prescribed. The regulation specifies an open site to prevent reflections affecting the measurement and a noise background at least 10dB(A) below the vehicle peak noise level. Although a few successful prosecutions have been made under this regulation, it is difficult to find sites where the traffic flow is low enough to meet the background noise and space requirements and yet conceal the microphone from drivers who might otherwise coast pass the test site. Furthermore, there is no means readily available to vehicle users to check that their vehicles can comply with the requirements of the regulation under all normal driving conditions.

1.2 *Improving the Control of Motor Vehicle Noise*

1.2.1 The more intrusive noise of road traffic emanates from commercial vehicles, sports cars and motor-cycles and the possibility of providing effective enforcement of the noise level limits prescribed for these vehicles has been investigated. It is essential in making noise checks to have prescribed the operating conditions of the vehicle and the conditions laid down in BS 3425: 1966 have been used as a basis of the present investigations. To deal specifically with the commercial vehicle problem, surveys have been made at a number of heavy goods vehicle (HGV) testing stations and these have shown that because of space limitations drive-past tests are impractical. Consequently, the investigations have been directed toward the evolvement of a test procedure that can be applied to vehicles while they are stationary and, which gives results comparable to those obtained from drive-past tests made in accordance with BS 3425: 1966.

2 Preliminary investigations and comparative tests to determine correlation

2.1 From the onset of the investigations it became clear that drive-past tests made in accordance with the British Standard test procedure are inappropriate to any kind of routine enforcement of vehicle noise regulations. This is because large (50m radius) open spaces required for this purpose are not available on a national basis and the operating speed of some vehicles during the test is too high for safety in confined areas. The possibility of evolving a low speed drive-past test for use in confined spaces has, therefore, been investigated. With this procedure, it has been found that consistent readings of noise level can be obtained from individual vehicles but, as indicated in Figure 1, a general correlation does not exist in a range of vehicles.

2.2 As a starting point to evolve a suitable test procedure for application to vehicles while they are stationary, consideration has been given to the procedure laid down in ISO Recommendation No. R362, which requires that measurements are made around the

stationary vehicle at eight specified points 7m from that vehicle. The results of a series of comparative tests (see Figure 2) show that there is no general correlation between the noise levels computed from measurements made in accordance with this procedure and those from the drive-past test described in BS 3425: 1966. Although the measurements are consistent and repeatable, the computed values can only be used as reference levels to check, for example, conformity of production and deterioration of vehicles in use.

2.3 ECE Regulation No. 9 (Uniform Provisions Concerning the Approval of Vehicles with regard to Noise) prescribes a modified version of the ISO test procedure, which requires measurement to be made at one point only and is supplemental to measurements made during the drive-past test. The measurement obtained from the stationary vehicle is intended only to provide a reference value for subsequent enforcement purposes. As with the ISO stationary vehicle test procedure, the measurement made under ECE Regulation No. 9 gives no general correlation with those obtained from the revelant drive-past test.

2.4 Noise surveys which have been made around a wide range of vehicles show that peak noise levels occur in a vertical plane at right angles to the longitudinal median axis of the vehicle and in line with the exhaust outlet. The measured noise levels closely approximate the equivalent levels obtained from BS. 3425: 1966 drive-past tests. The results of tests that have been made with diesel-engined vehicles and petrol-engined vehicles, respectively, are shown in Figures 3 and 4. In the case of petrol-engined vehicles, it has been found that in order to obtain correlation the engine must be run up to the manufacturers' recommended safe speed. Precautions must be taken, by the use of appropriate instrumentation (See Appendix 2), to prevent the engine from over-speeding.

3 Description of the evolved test procedure

3.1 *Site Requirements*

3.1.1 The drive-past test procedure described in BS. 3425: 1966 calls for an acoustical environment which can only be obtained in an extensive open space. If measurements have to be carried out in an acoustical environment which does not fulfil this requirement, it has to be recognised that the results obtained may deviate from the results obtained using the specified conditions. For the purposes of Construction and Use Regulation 89, a non-standard site is prescribed and a 3dB(A) tolerance is allowed to take account of noise reflections etc. which may influence the measurements. In practice, this tolerance has been found to be more than adequate and the results of tests have shown that, even in a more confined area than that prescribed in the regulations for roadside sites, the same tolerance can be used without adverse effect.

The dimensions of the test site should not, however, be smaller than those shown in Figure 5. Accuracy of measurement is influenced by four main factors, namely:

(a) sound absorption by the surface of the ground;
(b) reflections from objects such as buildings and trees;
(c) wind; and
(d) high levels of ambient noise

It is important, therefore that the surface of the ground within the test area is free from powdery snow, long grass, loose soil or ashes. There should be no substantial obstructions in the test area and sites between parallel walls should be avoided. The level of ambient noise should be such that the reading produced on the sound level meter is at least 10dB(A) below that produced by the vehicle on test.

3.2 *Instrumentation*

3.2.1 The essential instrumentation required for the purpose of making noise level measurements with stationary vehicles includes a sound level meter and in the case of petrol-engined vehicles a means to measure and control engine speed.

3.2.1.1 The sound level meter should comply with the requirements laid down for vehicle noise meters in Part I of BS. 3539: 1962, as amended by Amendment Slip No. 1 numbered AMD 22 and published on 1 July 1968. The weighting network and the meter time constant should be curve 'A' and 'fast response', respectively. The instructions provided by the meter manufacturer regarding the operation of the meter should be followed.

3.2.1.2 Before and after each series of measurements, the overall acoustic performance of the sound level meter should be checked using the reference noise source provided with the instrument. If the deviation of its reading from the corresponding reading taken at the time of the last free-field calibration exceeds 1dB(A) then the test should be considered invalid.

3.2.1.3 The sound level meter should have been calibrated not more than 12 months before the date of the noise level measurement and there should be a certificate recording the date on which the meter was found to comply with the requirements of clauses 8 and 9 of BS. 3539.

3.2.1.4 To facilitate making routine noise checks it is recommended that the sound level meter is used in conjunction with a dual microphone system. The microphones should preferably be proofed against atmospheric precipitation and unaffected by normal

variations of ambient temperature. Additionally, the meter should be provided with 'digital read-out' and 'peak-hold' facilities.

3.2.1.5 Brief specifications of suitable sound level meters are given in Appendix 1 and an automatic sampling read-out unit is illustrated in Figure 6.

3.2.1.6 A means should be provided to measure the engine speed of those vehicles that are fitted with petrol-engines. The instrument should also be capable of controlling engine speed, so that under free acceleration conditions damage caused by over-speeding and spurious noise due to valve bounce can be prevented.

3.2.1.7 A brief specification of a suitable speed indicator/controller is given in Appendix 2.

3.3 *Location of the Vehicle Relative to the Microphone*

3.3.1 The vehicle is driven to an appropriate site (see paragraph 3.1) and located such that the microphone(s) is at a distance of 7.5m from its longitudinal median plane and 1.2m above the ground. The microphone(s) is also in the vertical plane at right angles to the longitudinal median plane and in line with the exhaust outlet.

3.4 *Test Procedure*

3.4.1 The procedure is essentially an engine free acceleration test from idling speed with the engine at its normal working temperature. If the vehicle is fitted with any appliance or apparatus such as a concrete-mixer, a compressor, a pump, etc which is used while the vehicle is stationary and in normal service on the road, this equipment should be operating during the test.

3.2.4 On signals from the tester, the driver of the vehicle fully depresses the accelerator pedal and quickly releases it. The procedure is repeated until three consecutive consistent noise level readings are obtained from each side of the vehicle. The maximum of the two series of consistent readings rounded downwards to the nearest whole decibel is taken as being the noise level of the vehicle.

4 Feasibility of utilising the test procedure at HGV testing stations

4.1 The dimensions of HGV testing station compounds and the geographical nature of the immediate area surrounding the compounds varies considerably from one site to another. The locations of the testing stations vary from rural to urban and consequently the

acoustical environments differ. For example, at two typical sites ambient noise levels of 69/75 dB(A) and 50/54 dB(A) have been recorded. Each of these sites is suitable to determine those vehicles which have a potential to offend against a pre-supposed noise level of say 85 dB(A), ie at least 10 dB(A) above the maximum ambient noise level recorded.

4.2 The results of noise checks made at the two typical stations, mentioned in paragraph 4.1, on a total of 1891 vehicles have confirmed that reliable noise measurement is practicable, even at testing stations located in industrial areas, provided that the test grids are carefully sited. The acoustical environment of each testing station would have to be checked, using noise generating equipment, prior to siting the test grid and, if necessary, a correction factor allocated. Any subsequent construction operation, new building or new traffic scheme in the vicinity of testing station would give reason to re-check the acoustical environment.

4.3 Because of the semi-laboratory conditions that prevail at testing stations and the necessity not to interfere with vehicle through-put, the sound level meters would preferably be of a type, which incorporates "digital read-out" and 'peak-hold' facilities (see Figure 6). Weather-proofed microphones would probably be used to safeguard against having to abandon noise checks because of damage caused by atmospheric precipitation. Instruments to control and measure engine speed would also have to be provided if petrol-engined vehicles are to be checked.

4.4 The test procedure described in paragraph 3.4 is particularly appropriate for application at HGV testing stations because of the non-availability of conveniently situated sites of sufficient dimensions to make drive-past noise tests. However, irrespective of the procedure that may be adopted to check vehicle noise at these testing stations, special care has to be taken to ensure that unreasonable interference with vehicle through-put does not occur. For this reason, the following refinements to the test procedure have been developed.

4.4.1 The edge of the vehicle inspection pit is marked in accordance with Figure 7 and the vehicle is driven over the pit for its normal inspection so that the transverse axis of the front wheels coincides with the lines marked 'E'. The position of the exhaust outlet is then recorded on the vehicle inspection card. For example, "O/S—H" means that the exhaust outlet is at the offside of the vehicle and above the line marked "H" on the edge of the inspection pit. If the exhaust outlet is vertical the letter "V" is used as a prefix to the code.

4.4.2 On completion of the visual inspection, the vehicle is positioned centrally on a noise check grid marked out, as shown in Figure 8, on a site, as shown in Figure 9, which meets the requirements laid down in paragraph 3.1. In the case of

the example given in paragraph 4.4.1, the axis of the front wheels is positioned over the line marked "H" and thus locates the exhaust outlet, directly above the line marked "E".

4.4.3 The test procedure described in paragraph 3.4 is then followed.

4.5 Using this test procedure and without recourse to the sophisticated instrumentation mentioned in paragraph 4.3, the average time taken to make a noise check on a diesel-engined vehicle has been determined as 1½ minutes. Whilst only a small sample of petrol-engined vehicles have been similarly checked, the indication is that the equivalent time is 5 to 6 minutes. The additional time needed in these cases is attributable to setting up and attaching speed control equipment to the engine.

5 Conclusions

5.1 Measurements made in accordance with the test procedures described in Section 3 of this report give good correlation with those obtained from drive-past tests made in accordance with the procedure laid down in BS. 3425: 1966. It is stressed, however, that the correlation is explicit to existing vehicles and those currently in production, and fitted with conventional internal combustion engines. The reason for this is that at present engine exhaust noise is predominant and consequently engine noise and other sources of noise associated with the moving vehicle are masked. This situation is conducive to the utilization of a test procedure with the vehicle stationary. Once the problems of reducing engine noise have been resolved the situation may well change and the noise level measured with the stationary vehicle may not then bear so good a correlation with the drive-past test value.

5.2 The proposed test procedure is simple and can be applied economically for a variety of purposes, including the following:—

5.2.1 At HGV testing stations to enforce regulations designed to control the emission from individual vehicles. Appropriate instrumentation could be, either, permanently installed at testing stations, or, transported from one testing station to another by a spot-check team;

5.2.2 At the roadside to enable vehicle examiners and police officers to check vehicles in use for compliance with the noise regulations;

5.2.3 On manufacturers' premises during vehicle development and for quality control purposes. It would be necessary, however, to test pre-production prototype vehicles in accordance with the drive-past test procedure described in BS 3425: 1966 to check compliance with the requirements of Construction and Use Regulation 23 and for correlation with static test results;

5.2.4 On operators' premises or on premises set up by User Associations to enable the user to check for himself that his vehicle(s) complies with the requirements of the noise regulations.

6 Acknowledgements

This Report was prepared by Mr. A. E. Haines of VE(2) Branch of Vehicle Engineering Division of the DOE.

Thanks are due to the technical team, namely Mr. M. Lumley and Mr. E. G. Parrett who carried out the development test work and to Mr. R. J. White who analysed the test results.

The author gratefully acknowledges the help of the Managers and staff of Edmonton and Mitcham HGV testing stations in applying the test procedure for a limited period of time under conditions that prevail during normal operations at testing stations.

June 1971

APPENDIX 1

BRIEF SPECIFICATION OF SOUND LEVEL METERS REQUIRED FOR NOISE LEVEL CHECKS ON VEHICLES WHEN THEY ARE STATIONARY

1 Static equipment

1.1 *General*

The noise measuring equipment shall conform to the requirements of BS 3539: 1962 as amended by Amendment Slip No. 1 numbered AMD 22 and published on 1 July 1968*.

1.2 *Microphones*

1.2.1 A set comprises two microphones which must be capable of being mounted up to 30m from the read-out device;

1.2.2 the microphones should be proofed against atmosphere precipitation and normal variations of ambient temperature should not substantially alter their characteristics; and

1.2.3 the microphones should be supplied with connecting leads and tripods capable of supporting the microphones 1.2m above ground level.

1.3 *Read-out equipment—digital*

1.3.1 The noise level recorded from each microphone should be displayed on an indicator. The particular microphone being monitored should be indicated;

1.3.2 a change-over device should be provided to enable the tester to select one or other of the microphones;

1.3.3 in addition the equipment should automatically sample the out-put from each microphone in turn. The sampling time should not be longer than 30 seconds;

1.3.4 the system should have a "peak hold" facility to allow updating due to higher noise levels than those already displayed;

1.3.5 the system should include a "built in" calibrating device;

1.3.6 the meter may be housed in a wall mounting case or desk mounting case;

1.3.7 The system may be battery or mains operated.

*Some amendment to BS 3539 will be necessary to take account of the characteristics of the digital read-out equipment.

2 Portable equipment

2.1 *General*

The noise measuring equipment shall conform to the requirements of BS 3539: 1962 as amended by Amendment Slip No. 1 numbered AMD 22 and published on 1 July 1968.

2.2 *Microphones*

2.2.1 A set comprises two microphones which must be capable of being mounted up to 30m from the read-out device; and

2.2.2 the microphones should be supplied with connecting leads and tripods capable of supporting the microphones 1.2m above ground level.

2.3 *Read-out equipment*

2.3.1 The noise level recorded from each microphone should be displayed on an indicator;

2.3.2 a change-over switch should be provided to allow the tester to select one or other of the microphones;

2.3.3 the system should be supplied with a reference noise source for the purpose of periodically checking the overall accoustic performance of the meter;

2.3.4 the system should be battery operated; and

2.3.5 a carrying case should be provided for the equipment.

APPENDIX 2

Brief specification of engine speed indicator/controller

1 The equipment should be suitable for use with diesel and petrol engines:

1.2 *Read-out devices*

1.2.1 The instrument should have a total range of 0-6000 rpm in at least two scale ranges;

1.2.2 accuracy: 2% FSD of appropriate range (accuracy figure to include sensor errors);

1.2.3 the read-out head should be fitted with a device to close an external electrical circuit when engine speed reaches a pre-set limit determined by the tester; and

1.2.4 the system should be provided with a "hold-in" device requiring the operator to "re-set" before the external circuit can be opened.
The pre-set device should be variable over the range 100-6000 rpm.

1.3 *Sensing device*

1.3.1 The sensing device should be capable of being fitted to diesel and petrol engined vehicles in 30 seconds or less; and

1.3.2 the sensor should be proofed against atmospheric precipitation and unaffected by normal variations ambient temperature.

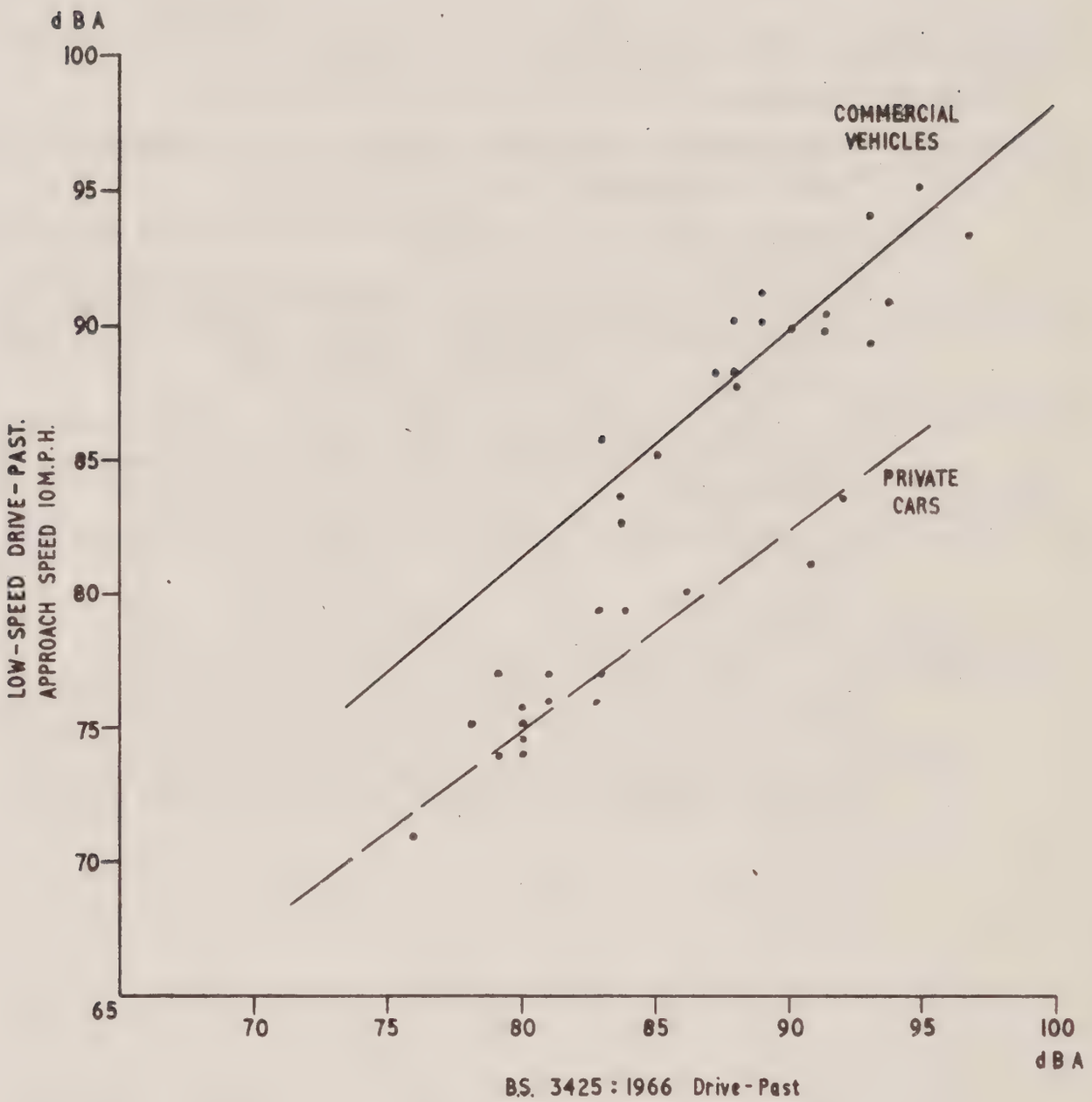

Figure 1. **Comparison of results obtained from low-speed drive-past test and B.S. 3425: 1966 drive-past test.**

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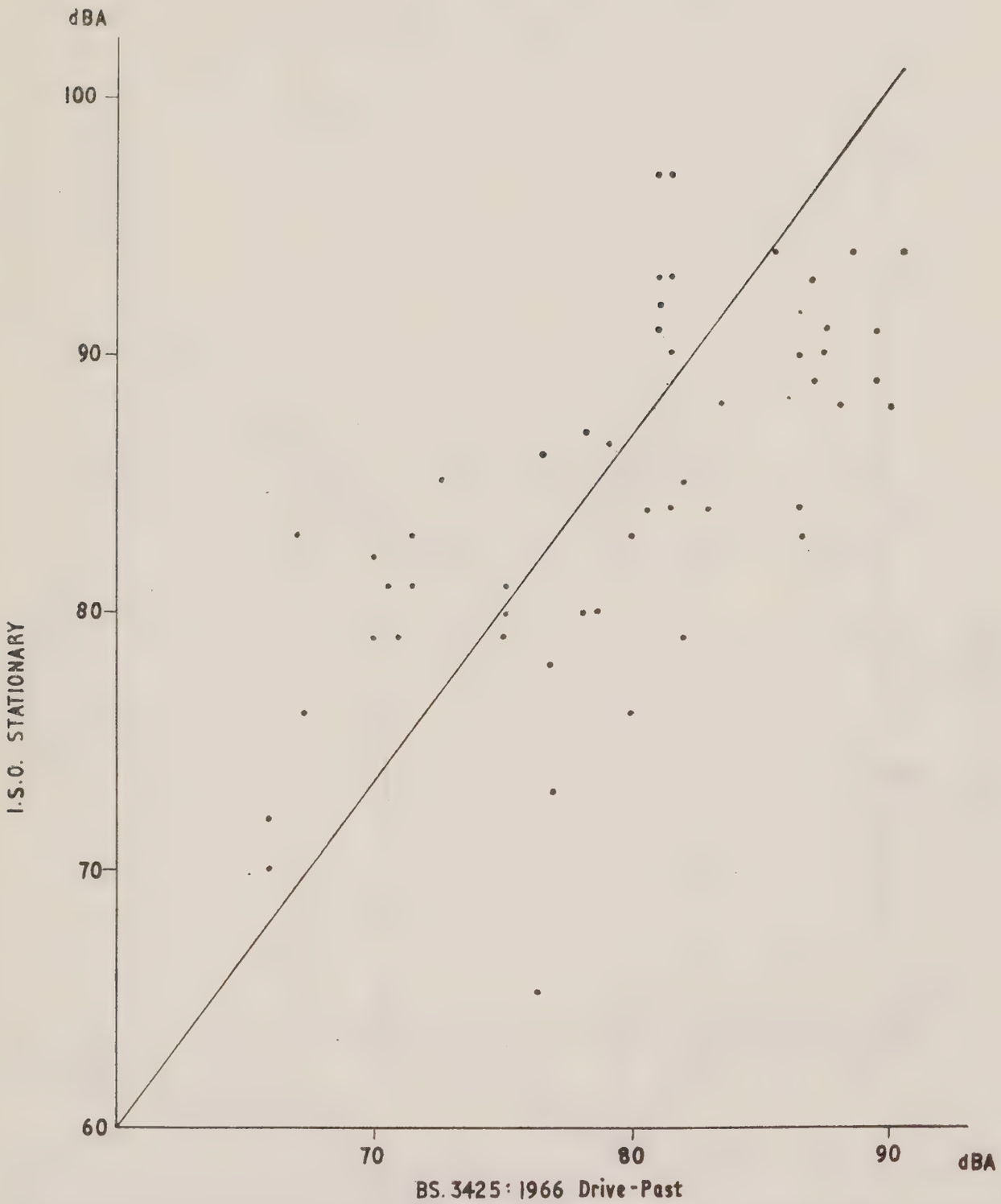

Figure 2. **Comparison of results obtained from I.S.O. stationary vehicle test and BS. 3425: 1966 drive-past test.**

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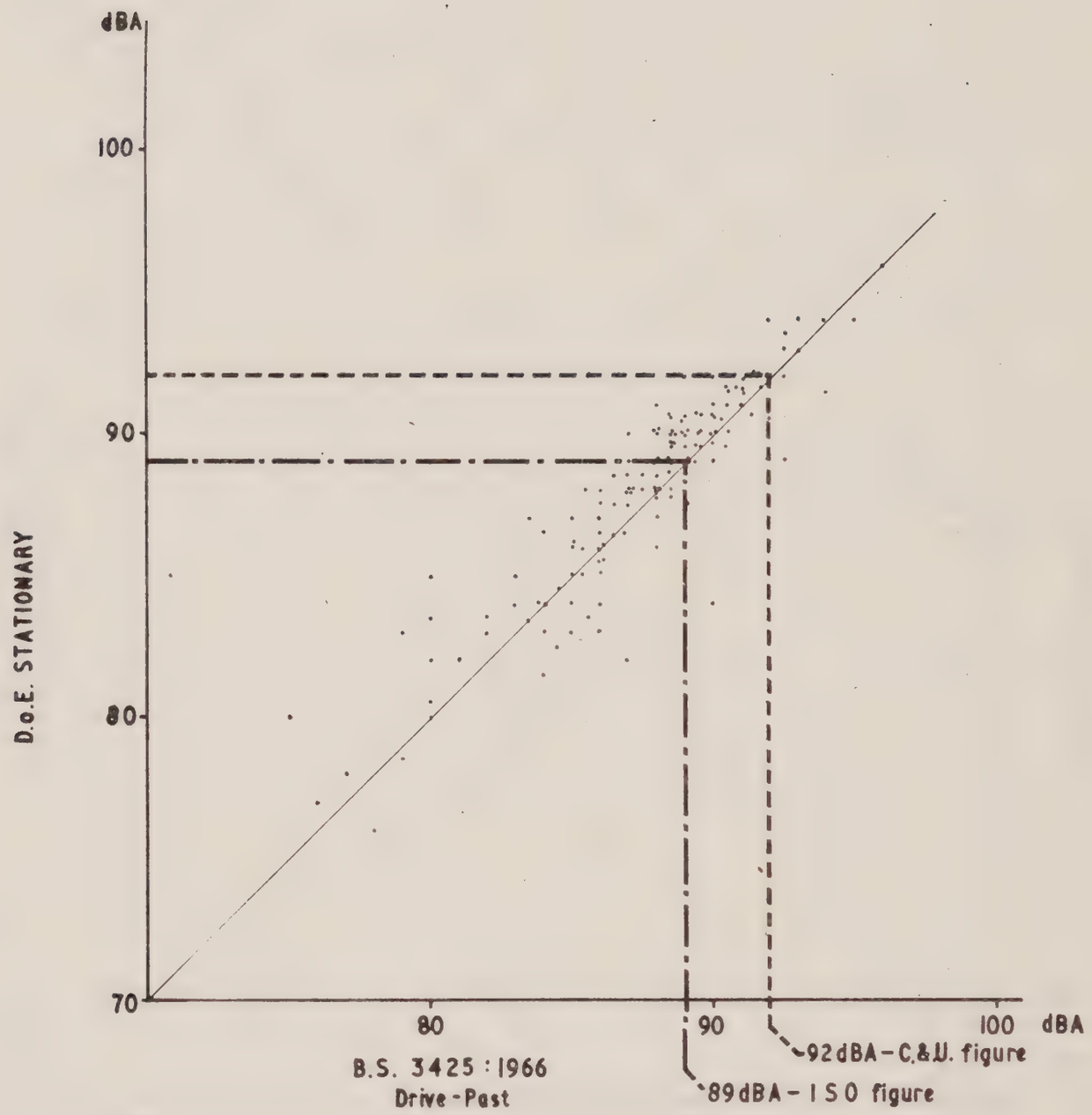

Figure 3. **Comparison of results obtained from evolved stationary vehicle test and B.S. 3425: 1966 drive-past test for DIESEL engined vehicles.**

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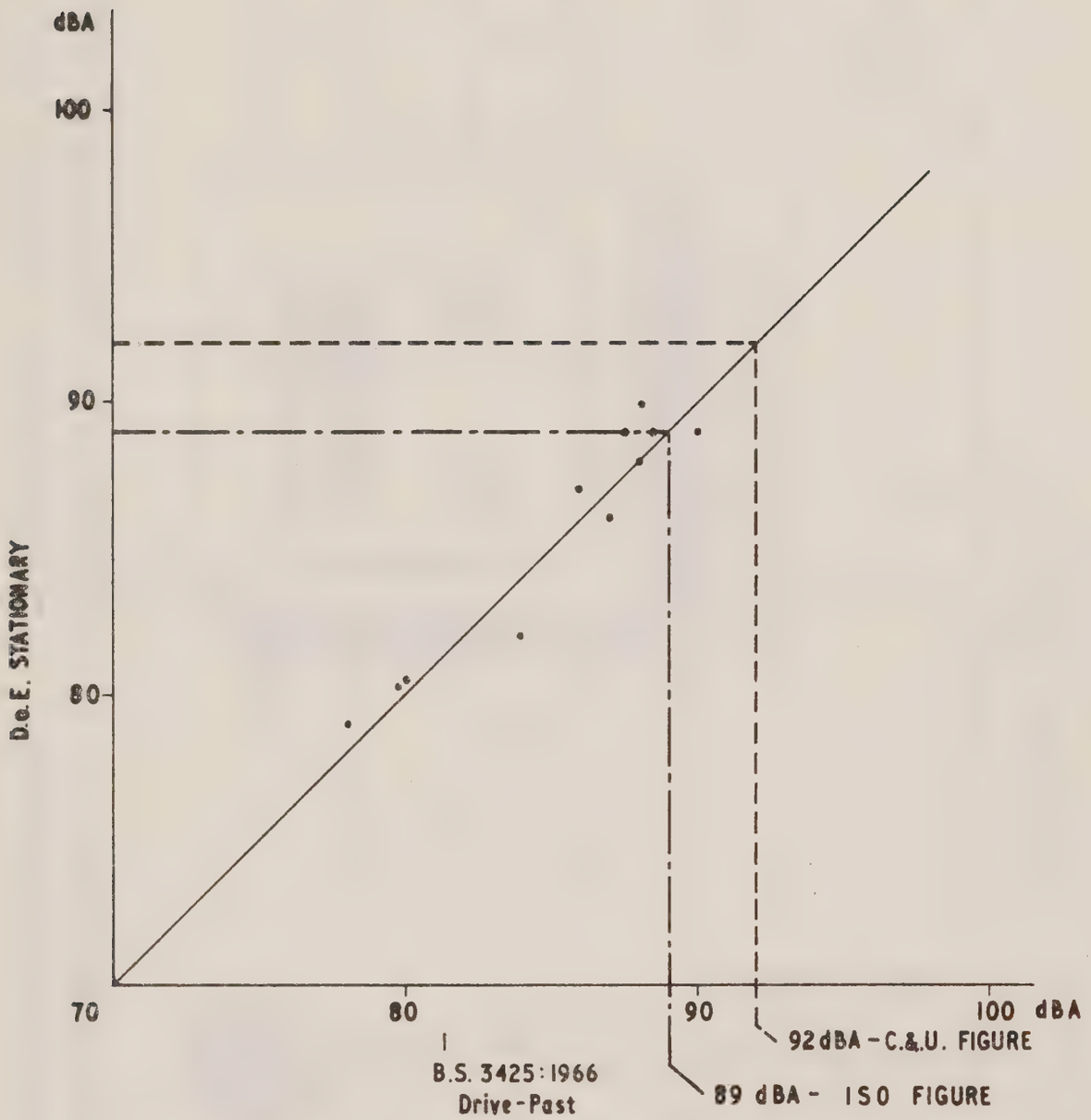

Figure 4. **Comparison of results obtained from evolved stationary vehicle test and B.S. 3425: 1966 drive-past test for PETROL engined vehicles.**

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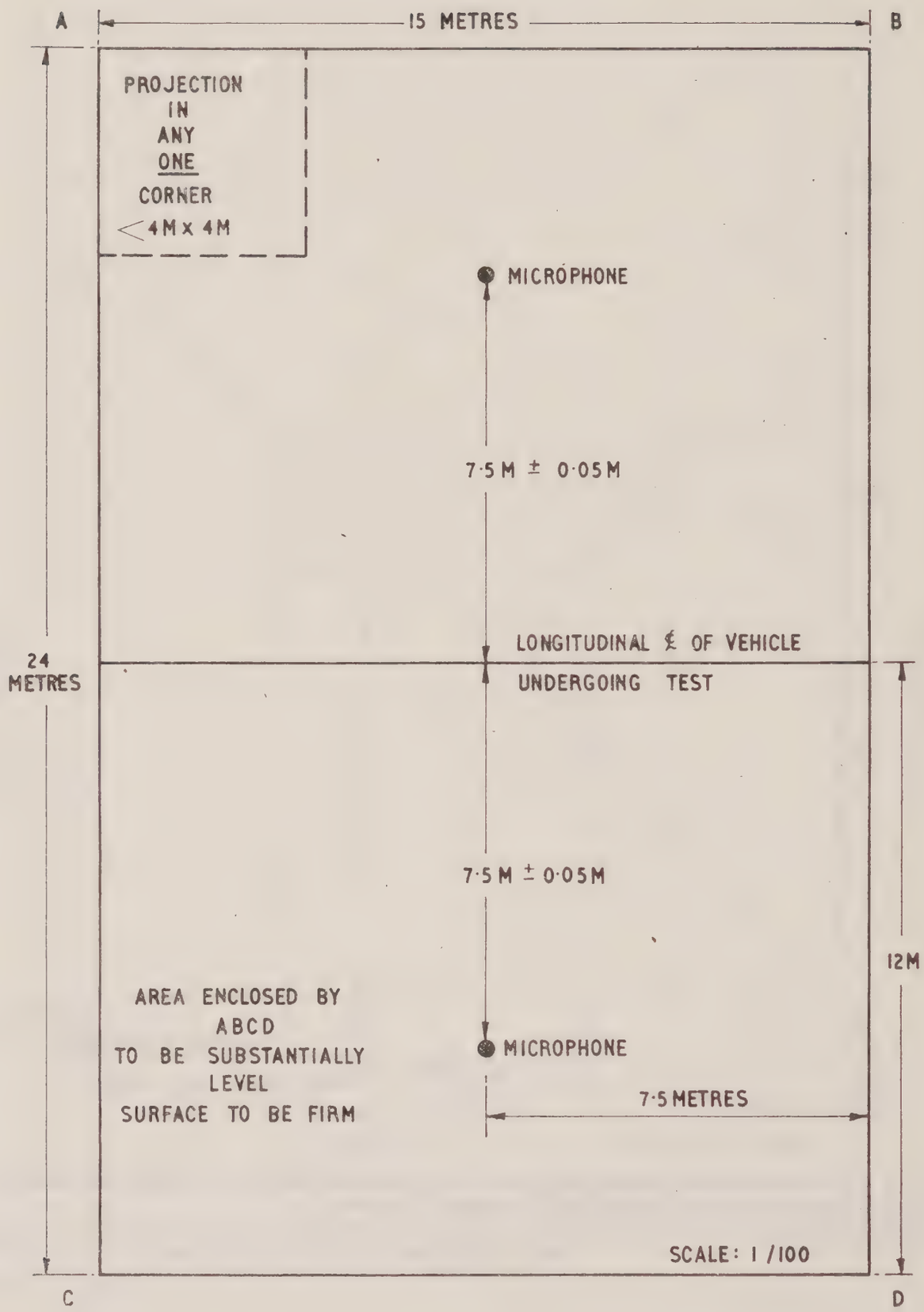

Figure 5. **Minimum dimensions of test site for D.o.E. stationary vehicle test.**

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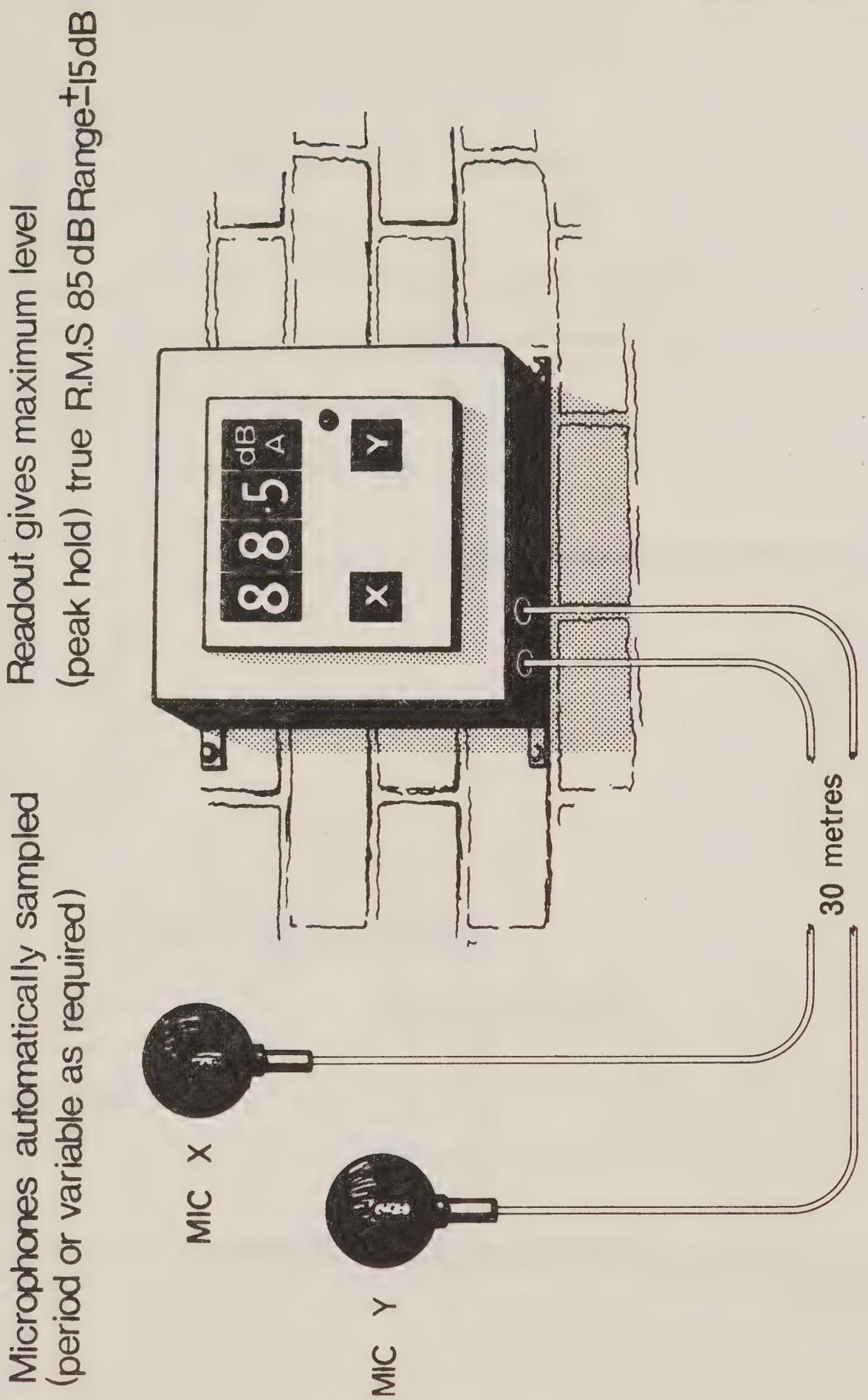

Figure 6. **Sketch of automatic sampling read-out unit - D.o.E. test.**

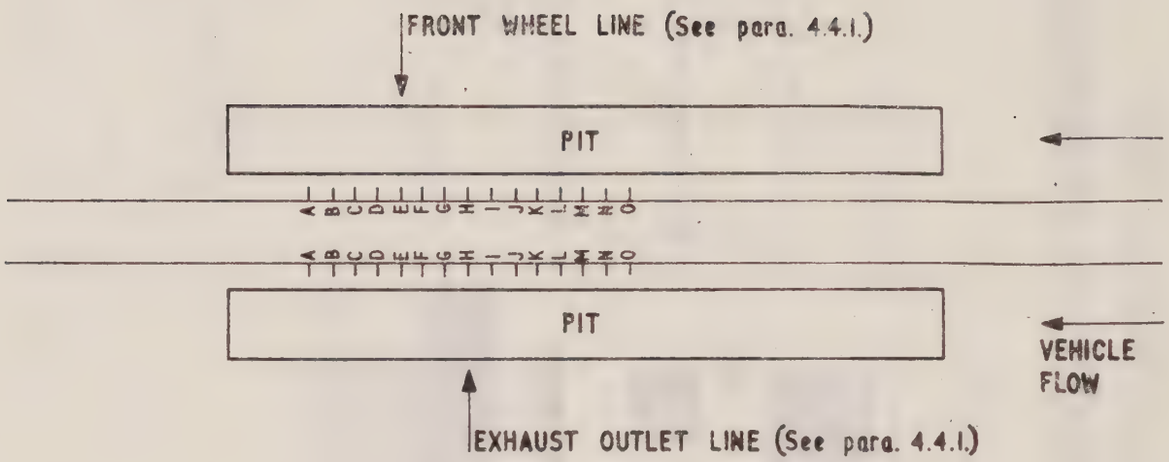

Figure 7. **Vehicle inspection pit marking.**

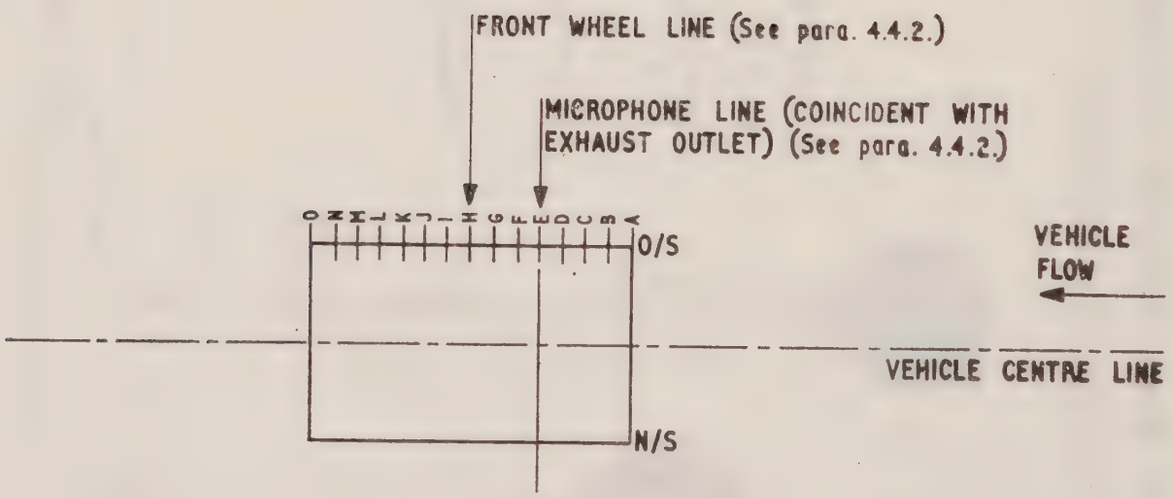

Figure 8. **Layout of the noise check grid D.o.E. stationary vehicle test.**

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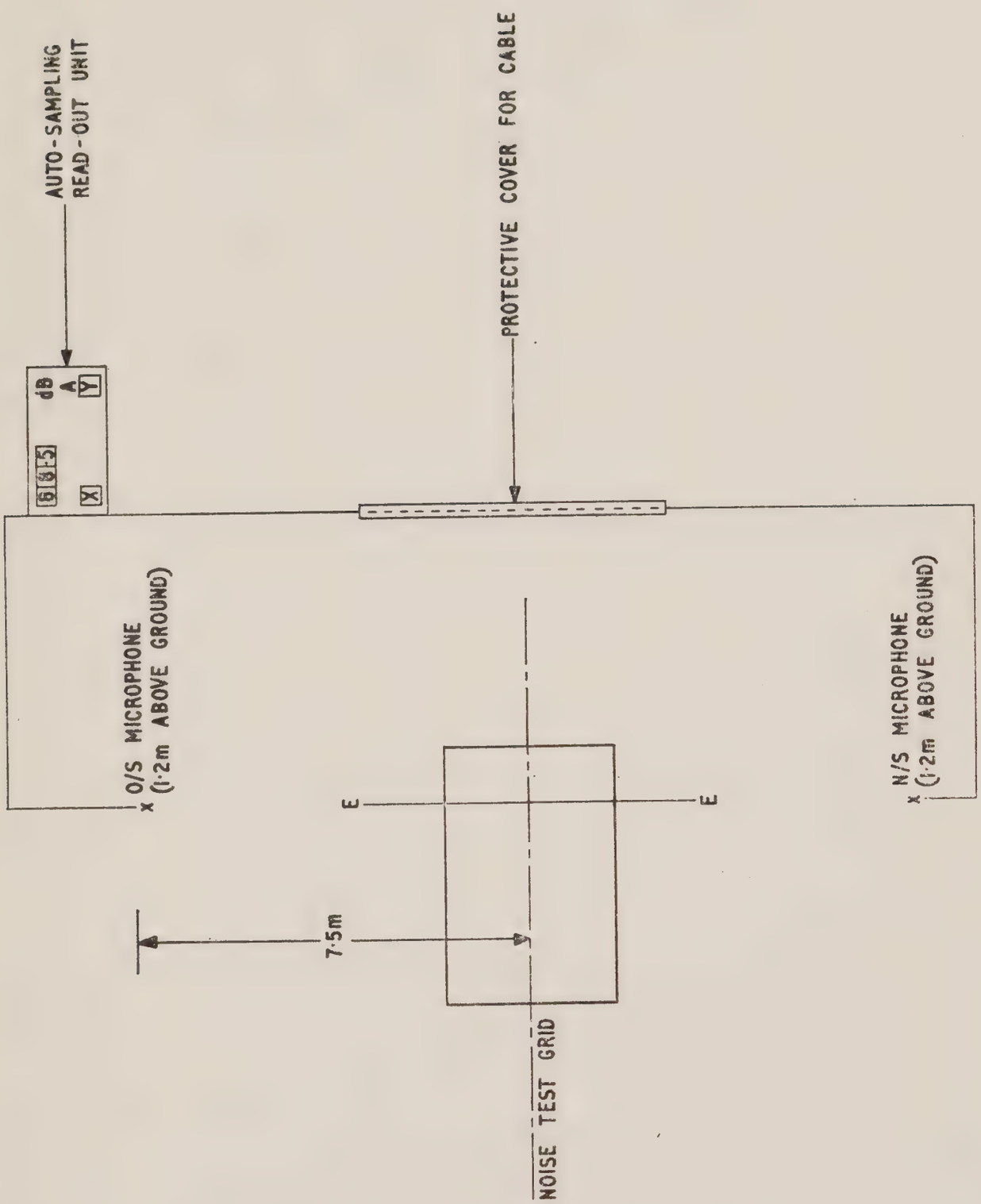

Figure 9. **General layout of the test site D.o.E. stationary vehicle test.**

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